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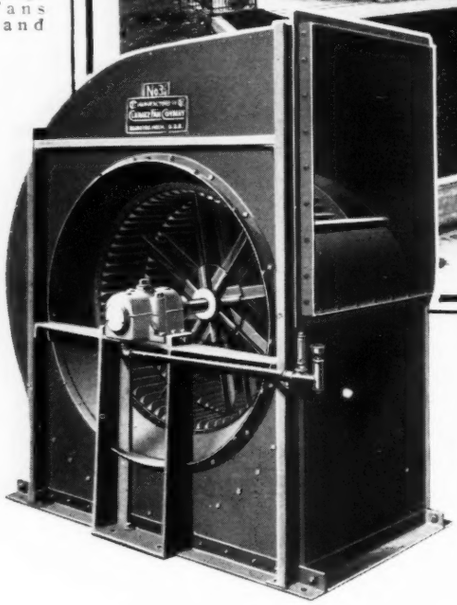

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The Heating and Ventilating Magazine

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# Allotment of Space for the Mechanical Equipment of Buildings

## Provisions Which Should Be Made in the Initial Design of a Modern Building to Properly Accommodate the Apparatus

*By Nelson S. Thompson*

*Chief Engineer, Office of the Supervising Architect, U. S. Treasury Department.*

The allotment of generous spaces by architects and structural engineers for the mechanical equipment of buildings is a matter of the first importance and is too frequently overlooked until too late. Many projects are marred by the failure of the mechanical engineer to impress upon the architect or owner the necessity of considering this problem more carefully in the early stages of the design of the building. With the idea that a discussion of the subject may serve to bring about closer co-operation between the architect and engineer, the following data are submited by Mr. Thompson, whose long and varied experience in the design of all the mechanical equipment installed in buildings erected by the United States Treasury Department, particularly post-office buildings and court houses, gives him an exceptional knowledge of the requirements. His article supplements one by H. L. Clute on "Space Requirements for Mechanical Equipment," which appeared in "The Heating and Ventilating Magazine" for December, 1922, and January, 1923.

THE FIRST step to be taken in the design of a building consists in obtaining a correct survey of the site, as the proper design of the drainage system, gas and water piping, and electrical service connection is dependent upon the correct location and elevations of the gas mains, the water mains and especially the sewers.

If no public sewer is available it may be necessary to construct a private sewer of considerable length, or to install a cesspool or a septic tank, and possibly sprinkling filters. The necessary data must be gathered in regard to the legal requirements for right of way of sewers and those affecting the design and construction of septic tanks, point of discharge of septic tanks or sewers into streams, etc.

The specific use of the service poles shown on the survey should be determined in connection with the telephone and lighting services, and, if the latter is underground, the location of the nearest manhole should be obtained. The various service companies should be freely consulted as to the point of entrance of their feeders, in order that proper provision may be made for them on the building plans.

### THE SECOND STEP

The second step should be the preparation of tracings of the architectural floor plans, as soon as they have been determined, in order that the engineer may indicate all chases necessary for any part of the mechanical equipment; the size and location of openings for smoke breeching and stack; the size and location of all warm-air flues and registers, cold-air inlets, ventilators, vent ducts, flues, and spaces required for boilers, fans, heaters, air washers and other machinery; the location of electric outlets, cabinets, tablets, and switchboards which will be required in connection with the power and lighting service; and the space required for elevator machinery, etc.

The above data should be transferred to the architectural plans, and it is imperative that thorough consideration be given to these preliminary studies, as they fix the design of the equipment, with very little chance for later change.

### TIGHT CONSTRUCTION IMPORTANT WITH HIGH FUEL COSTS

The greatest care should be exercised in the design and construction of the walls of buildings, especially of dwelling houses, to reduce the heat

loss and air leakage to a minimum. Special care should be taken to make the ceiling of the top story as nearly air tight as possible. The constantly rising price of coal and other fuel makes these matters of first importance, and great economies may be effected here by due foresight. The United States Bureau of Standards and other agencies have made investigations into this matter, and every engineer, architect or builder should familiarize himself with the results of these investigations and help to conserve the coal supply of the world.

### OTHER DETAILS REQUIRING PRELIMINARY ATTENTION

In first-class buildings it is suggested that consideration be given to the following:

A clear space of not less than 4 in. should be provided from the top of the floor beams and girders to the top of the finished floor for the reception of steam pipes, conduits, etc. This provision for space in floor fill is of great importance and should be insisted upon.

All vertical pipes should be concealed in chases or furring if possible.

Heating pipes may be run in the same chases with downspouts, but not in the same chases with soil or waste pipes if it is possible to avoid it. Electric feeders must not be run in chases with heating or water pipes.

Toilet rooms should *not* be raised above the general floor level.

In laying out chases for the reception of conduits or pipes 12 in. of solid wall should be left back of chases in exterior walls and 9 in. in interior walls. The minimum depth from plaster line to back of chase should be 8 in. for 5 and 6-in. pipes, 6 in. for 3 and 4-in. pipes, and 4 in. for pipes smaller than 3-in. The width of chases should be 12 in. for two 4-in. pipes, 8 in. for one 4-in. or 5-in. pipe, 8 in. for two 2-in. pipes. No chase should be made less than 8 in. wide unless structural conditions preclude it, in which event a 4-in. chase may be used for a 2-in. pipe.

No chase should be placed nearer than 9 in. to a beam bearing, nor nearer than 15 in. to a girder bearing, nor nearer than 12 in. to any window or other opening.

It would seem to be axiomatic that all toilet rooms should be located on exterior walls and be provided with generous windows or skylights. If not, ample ventilation should be provided, preferably by means of a fan which will change the air in the toilet room at least ten times per hour.

Except for positive ventilation of toilet rooms, no ventilation is usually provided in office buildings unless they have garages in the basement, in which case the local building regulations will govern the ventilation of the garage spaces.

In rooms having at least 1,000 cu. ft. of space per occupant, and with the area of the wall and glass equivalent to 25% of the total floor area, special ventilation is unnecessary.

In cases of dense occupancy of any portion of a building, or where dust, smoke or fumes are generated, the matter of ventilation should be entrusted to a competent engineer.

When automatic temperature control is not used, in order to secure a certain amount of temperature control with steam heating systems, at least two radiators should be installed in each room having two or more windows, so that in mild weather one radiator may be shut off and remain out of service.

The average winter temperature throughout the United States north of Richmond, Va., is approximately 40° F., and the average heating apparatus is figured on a basis of zero, which only obtains a few days during the winter season.

As a rule the necessity of permitting rearrangement of office space requires one radiator under each window, and said radiators will average 25 sq. ft. of heating surface each, as a rule.

Direct radiators located under windows should not project above the window sill, consequently fairly high window sills should prevail, as low radiation costs more than the two standard heights—38 in. and 32 in.

To approximate roughly the total amount of direct steam radiation required in an office building in the latitude of Washington, D. C., it will be fairly safe to divide the architectural cubic content by 100, unless cheap construction has been adopted.

Hall space for electric light and power cabinets and also telephone junction cabinets is absolutely necessary, and should never be left to chance selection by mechanics after construction begins.

Demands are made by tenants for a large number of floor and wall outlets for connecting adding machines, vacuum cleaners, portable fixtures, etc., and receptacles must be provided generally to meet these demands.

It is important to remember that the authorities will not sanction the locating of electric meters and main feeder switches near gas meters, nor will they permit them to be installed in inaccessible places which firemen can not find readily in an emergency.

In large office buildings, which of necessity require large feeders, etc., a wire shaft at least 3 ft. wide and 4 ft. deep should be provided.

Switchboards are necessary in large buildings, and are placed about 2 ft. from a wall in the rear, and require a ceiling height of about 7 ft. 6 in. in the clear to accommodate the switchboard and a junction box over the board where the feeders are crossed to reach their respective switches.

### NOTES ON THE LOCATION OF LOW-PRESSURE HEATING BOILERS

When giving consideration to the location of a low-pressure heating boiler, always make the smoke breeching as short and direct as possible, and generally make is circular in order to reduce friction to a minimum. There is very little power in a stack, and it takes the major part of this power (or draft) to force the air through the grate bars, the coal bed, and the more or less tortuous passages in the boiler and breeching. Make this paramount in boiler location. There is but little objec-

tion to a long steam main, and even natural light on the boiler front and ease of delivery of coal from the fuel room to the boiler must be made secondary to a short breeching.

The points for consideration in heating boiler location, in the order of their importance, are as follows:

1. The boiler must be located so that the tubes can be cleaned or renewed. This generally allows a generous firing space, which should be not less than 10 ft. in the clear.
2. The boiler must be located to favor a short, direct breeching.
3. The boiler should be located facing the coal storage room and close to same.
4. The boiler should be located so that its front will face natural light.

In small buildings where boilers are used for heating only, to provide a space or room for the storage of a season's supply of coal, so that it may be purchased about April 1, when the cost is lowest, there should be allowed 50 cu. ft. of space for each ton of coal; or for a six-room house which would burn six tons per season, the coal room should contain 300 cu. ft.; say a room 6 by 8 ft. in dimensions, with coal space 6 ft. deep. In the ordinary residence one ton of coal per room per heating season is about the average coal consumption.

### IMPORTANCE OF PROPER SIZE SMOKE STACK

Of first importance in a system of heating, especially where coal is the fuel to be used, is the chimney or stack. Great care should be taken to select the proper size of stack, and every precaution should be used to insure its proper construction. An engineer should be consulted by the architect, when conditions permit, as to the proper size, location and construction of the chimney or stack. The following table may be used as a guide, care being taken that any error shall be on the safe side.

The top of the chimney should be above the highest point of the roof, 3 or 4 ft. preferably, so that the draft may not be adversely affected by the winds:

| Direct radiation in square feet | | Size of flue | |
|---|---|---|---|
| | | Round | Square |
| Steam | Hot Water | Dia., In. | Dimen., In. |
| 250 | 400 | 8 | 8 x 8 |
| 400 | 700 | 8 | 8 x 8 |
| 500 | 850 | 10 | 8 x 12 |
| 700 | 1,250 | 10 | 8 x 12 |
| 1,400 | 2,400 | 14 | 12 x 16 |
| 2,200 | 3,700 | 16 | 16 x 16 |
| 3,500 | 6,000 | 18 | 16 x 20 |
| 5,000 | 8,500 | 18 | 16 x 20 |

No flue should be smaller than 8 in. x 8 in. for hard coal, or 8 in. x 12 in. for soft coal.

No flue should be less than 26 ft. in height.

### SIZING SMOKESTACKS FOR USE WITH PORTABLE STEEL BOILERS

The formula for smokestack for use with portable steel boilers, horizontal-return tubular boilers, used for low-pressure heating, is as follows:

$$\text{Area of stack in square feet} = \frac{\text{Area of grate in square feet}}{\sqrt{\text{Height}}}$$

It is frequently necessary in the larger buildings, where boilers are used for power and heating, to approximate roughly the extent of the mechanical equipment for the guidance of the architect in his preliminary studies, and the following approximations will serve this purpose, unless more accurate methods are available to the designer.

One boiler horse power will be required for each 7,000 cu. ft. (architectural cubic content) of a moderate or large-sized building for the purpose of power and heating, or for heating alone, which constitutes the major demand in office buildings, post offices, court houses, etc. This covers due allowance for spare boiler.

The full connected power load in such buildings will rarely exceed 2 watts per square foot of total floor area, and the maximum demand will rarely exceed 60% of the full connected load. Roughly, the total floor area, divided by 800, will equal the total kilowatt rating of the electric generating plant, including spare units.

Be sure that there are openings from the outside of building to the boiler room large enough to permit the installation and future removal of the boilers.

### LIMITING PRESSURES AND SIZES IN THE SELECTION OF TYPES OF BOILERS

Horizontal-return tubular boilers are entirely satisfactory under ordinary conditions, both in first cost and operation, at steam working pressures not exceeding 150 lbs. per square inch, and when the size of the unit does not exceed 160 horsepower. For higher steam pressures and larger units the choice usually falls on water-tube boilers.

Not less than 5 sq. ft. of floor area per boiler horsepower should be allowed for the accommodation of the usual small boiler plant in the average office building, and a similar allowance should be made for the reception of the usual small three-unit electric generating plant.

### SPACE REQUIREMENTS IN BOILER ROOM

The ordinary water-tube boiler in general use in large office buildings has tubes 18 ft. long, and the usual dimension of length of setting is 20 ft. Space in front of boilers must be provided for withdrawing and renewing tubes. Generally this space must not be less than 20 ft. In any case, where tube renewal does not govern, ample space in front of boiler must be provided for firing. This space should not be less than 10 ft.

To permit repairs and as a measure of safety for the operators, ample space must be allowed at the rear of boilers and for alleyways between boiler settings and at sides of settings. These spaces should never be less than 4 ft. and twice this distance is desirable. At least 4 ft. space should also

be provided between the top of the boiler setting and the underside of the ceiling beams. Cramped space at this point is very objectionable, and the 4-ft. space should be increased to 6 ft. whenever possible.

The following are the mimimum clear ceiling heights which must be allowed from ash-pit of boiler setting to underside of ceiling beams, to insure a proper installation of coal-fired, water-tube boilers, with modern settings, using underfeed stokers.

For boilers of 150 to 300 horsepower, 24 ft.

For oil-fired and hand-operated stokers, or down-draft furnaces, 18 ft. should be the minimum height.

For horizontal-return tubular boilers the foregoing minimum clear heights may be reduced 3 ft.

The boilers are to be arranged, when possible, to give a short, direct connection to the stack, and so located as to be close to the engine room and convenient to the coal and ash rooms.

A firing pit is always a detriment and is to be avoided if possible.

### ARRANGEMENT OF ENGINE ROOM

The engine room should be located either directly in front of or directly in the rear of the boiler room, to give the shortest pipe connections and, consequently, the least friction and condensation in the steam mains. This arrangement of the engine and boiler rooms allows for increase in the boiler, engine and switchboard capacity by lateral extension, giving at all times a neat and compact arrangement of the apparatus.

The engines should be arranged with cylinders on center line parallel with center lines of boilers and close to the partition wall between boiler and engine-rooms, with a clearance between cylinder head and wall sufficient to permit withdrawal of the piston rods, usually from 5 ft. in the small engines up to 10 ft. in the large sizes. A three-unit engine plant is generally economical and all that is necessary.

Special study should be given to the matter of getting coal into the buildings and ashes out of them in the most economical and satisfactory manner. These are features of first importance in the operation of the building and are generally overlooked by architects, especially the subject of ashes, which aggregate 10% of the coal burned. Some suitable apparatus should always be installed to handle the ashes with the least inconvenience, dust, etc.

## Heating Semi-Exposed Portions of Buildings

It is a well known fact among men who have charge of buildings, that their greatest worry during the winter months is the heating of the semi-exposed parts of their building, to wit: pent houses and gravity tanks, especially in the buildings protected by the sprinkler system, with the mass of piping installed in the pent houses.

Under the semi-direct heating system, the custom has been to tap the top of the riser nearest the pent house, but this riser has been so rduced in size that when it reaches the top of the building, it is almost impossible to get the required amount of steam to feed the radiators and the long lines of exposed pipe, especially in freezing weather, as there has been too much condensation taken off the end of the risers.

In such weather it is necessary to keep steam on in the entire building, at a great expense in fuel and labor, in order to save the exposed or semi-exposed piping on the top of the building.

On the other hand, direct steam lines from the boilers to the pent house radiators can and will heat the above-mentioned places with banked fires, even when the steam is entirely shut off in the main building.

During freezing weather allow the steam to rise on low pressure to say 10 lbs., on high pressure to a little over 20 lbs., then bank the fires, close the dampers and drafts and you will be assured of from two to three hours' good circulation.

Most buildings have a night man; and when he sees the steam dying down, he should open his dampers and drafts and allow the steam to rise again as before. A few shovels of coal each time this is done is all that is required.

Where all the windows and doors are closed, the circulation of steam for a short duration is sufficient. The direct steam line should be not less than 2½ in. in diameter, well covered, with a reducing valve at top, so that the engineer can regulate steam as he sees fit. In new buildings, this line can be installed at a very much lower cost than in buildings already completed.

That we have a direct steam line to the pent house in the building in charge of the writer, was what you might call an accident. When the building was erected a 5-in. steam pipe was installed to feed steam to tenants who might wish to use it in the line of business, manufacturing, etc.

When the writer assumed charge of this building, the line which reached the top floor was not in use, so he attached it to the pent houses and tanks and, to this day, it has not caused a bit of trouble, but has saved thousands of dollars for the owners.

To install this system in buildings already completed, would prove a profitable venture, for within a very short time, the saving in the cost of fuel and labor would more than equal the amount expended for the installation.

Architects have given some attention to this matter for in some modern buildings they have enclosed gravity tanks. Still, at that, the coldest part of the building is the top housing and must be heated. The Fire Insurance Exchange deems this matter of such importance that it sends out a special letter, every year, warning owners and superintendents about pent houses and exposed places.—JOHN G. GARRAWAY, SUPERINTENDENT MANUFACTURERS BUILDING, NEW YORK IN THE *New York Building Superintendent.*

# A Short, Practical Method of Designing Gravity Water Heating Systems

## With Six Illustrative Problems Frequently Encountered in Practice, and Their Solutions

*By F. E. Giesecke*

*Professor of Architectural Engineering, University of Texas*

## IV—Design of System III A

*Previous articles in this series are as follows: January, 1924, Design of an Elementary Heating System; February, 1924, Design of a Simple Water Heating System; April, 1924, Design of One-Pipe System for a Small Building.*

LET IT BE required to design the pipe lines and radiators for the "two-pipe" system shown in Fig. 11A.

This system is intended for a three-story building in which all rooms are to be heated to 70°. The first floor radiator is to dissipate 10000 B.T.U., the second-floor radiator, 8000 B.T.U., and the third-floor radiator, 12000 B.T.U., per hour.

The radiators are located, with reference to the heater, so that the centers of the radiators are, respectively, 7 ft. 0 in., 17 ft. 0. in., and 27 ft. 0 in. above the center of the heater. The system is piped so that water, leaving the heater, may take any one of three paths. The first path leads through Radiator I, the second through Radiator II, and the third through Radiator III. The correct solution of the problem requires that the three paths be so proportioned that the proper quantity of water will flow through each of the three radiators.

If we compare the path through Radiator I with that through Radiator III we find that Radiator I has an advantage over Radiator III in having a shorter circuit and, therefore, probably a smaller friction head; we also find that Radiator III has an advantage over Radiator I in being located higher above the heater and having, therefore, a larger pressure head.

We know from experience that in systems like the one under consideration, and as generally installed, the advantage of Radiator III over Radiator I, due to the larger pressure head, more than outweighs its advantage, due to the larger friction head and that, as a rule, Radiator III will "rob" Radiator I of a part of its water. Similarly, Radiator II has an advantage over Radiator I but is at a disadvantage as compared with Radiator III. In other words, in so far as the flow of hot water through the several radiators is concerned, Radiator I is the least-favorably located of the three radiators in the system.

### DESIGN SHOULD BEGIN WITH LEAST FAVORABLY LOCATED RADIATOR

In designing a two-pipe system, we always begin with the least-favorably located radiator and design its circuit so that it will receive its proper supply of heat, knowing that we can then easily design the circuits of the other, more-favorably located, radiators so that they, also, will receive their proper supply of heat.

It is not always easy to designate the "least-favored" radiator in a heating system, but in System III A we can see by inspection that Radiator I is the least favored of the three.

In designing Systems I and II, the calculations were very simple; for System III they are more complicated and it is advisable to adopt some systematic method of procedure. The following method is recommended:

### SUGGESTED METHOD OF CALCULATING SYSTEM

1. Divide the several circuits of the system into sections so that every section will contain only one pipe size and only one rate of flow of heat. For example, the circuit of Radiator I should be divided into four sections; the first section extending from H to A; the second from A to 1; the third from 1 to B; and the fourth from B to H. The point A must be the division point of two sections because the section H-A conveys the heat for all three radiators, whereas Section A-1 carries only the heat for Radiator I.

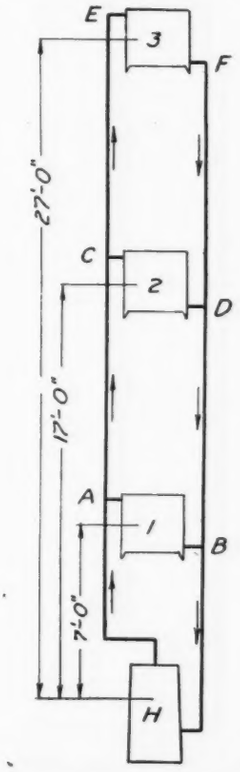


**Fig. 11A. Diagrammatic Representation of System 111A**

For a similar reason B must be a division point.

The reason for selecting 1 as a division point is that it is often necessary to select a different pipe size for Section A-1 than for Section 1-B, in order to secure the proper friction head for Radiator I. If we were certain that the pipe size for Section A-1 could be the same as that for Section 1-B we could call the pipe line from A to B one section; since we cannot tell in advance what the pipe sizes leading to and from the radiator must be, it is best to make the radiator the division point of two sections.

2. Having divided the several circuits into sections, prepare a table, like that shown below, and

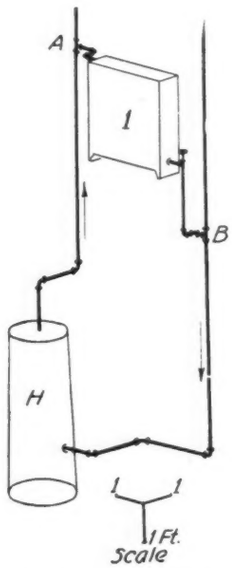


Fig. 11B. Detailed Construction of System 111A

record there the designations of the several sections, the quantity of heat conveyed by each section, and the number of feet of pipe and the number of elbows or elbow equivalents in each section. All of this information should be obtained from the plans for the heating system. In Fig. 11A is shown only a diagrammatic representation of the system to illustrate the general arrangement. In this case a number of elbows, valves, air valves, and the expansion tank are omitted in order to simplify the drawing. For the actual design, a complete drawing, such as that shown in Fig. 11 B, must be available or the designer must be sufficiently familiar with the proposed installation to be able to insert the correct pipe length and the correct number of elbows or elbow equivalents in the description of each section, as recorded in the table below.

3. Calculate the pressure head available for the circuit and record it in the table.

4. Calculate the pipe sizes for the several sections so that the sum of the friction heads in all the sections composing any one circuit is equal, as nearly as practicable, to the pressure head available for that circuit.

### HOW TO PROCEED WITH THE DESIGN

We will now design the pipe system according to the method recommended, beginning with the circuit for the least-favored radiator, i. e., Radiator I.

We will divide this circuit into four sections, as shown in Fig. 11A. We note from the pipe diagram that all the heat for the three radiators, namely 8,000+10,000+12,000, or 30,000 B.T.U. must flow through Sections H-A and B-H; also that Sections A-1 and 1-B convey only the heat for Radiator I, namely 10,000 B.T.U., and record this information in the table as shown.

We note from the drawing that Section H-A contains 8.67 ft. of pipe, two elbows, and one heater connection, which we place equal to 1½ elbows; so we record in the table 8.67 ft. of pipe and 3.5 elbows.

Similarly, we see from the drawing that Section A-1 contains 1.3 ft. of pipe, one tee, two elbows, and one radiator connection, so we record 1.2 ft. of pipe and 5.5 elbows for that section. We make similar records for the other two sections.

### CALCULATION OF PRESSURE HEAD

To calculate the pressure head we select the temperature for which the system is to operate when the quantities of heat specified above are being dissipated by the radiators.

Let us assume that the water in the flow riser is to have a temperature of 200° F. and that in the return riser a temperature of 180° F. We will then find from Diagram I (see THE HEATING AND VENTILATING MAGAZINE for January, 1924) that the pressure head is 90 m.i. per foot of riser. The total available pressure head is, therefore, 7 × 90 or 630 m.i., which we record as shown.

### FIGURING PIPE SIZES FOR CIRCUIT I

To calculate the pipe sizes for Circuit I we assume

CIRCUIT I

Pressure-head = 7 x 90 = 630 m. i.

| Section | B.T.U. | Feet Elbows | Assumed Diameter | Unit Friction | Total Friction | Selected Diameter | Unit Friction | Total Friction |
|---|---|---|---|---|---|---|---|---|
| | | | In. | | | In. | | |
| H-A | 30,000 | 8.67 | 1½ | 12 | 104 | 1½ | | 104 |
| | | 3.5 | | 35 | 122 | | | 122 |
| A-1 | 10,000 | 1.2 | 1¼ | 3.5 | 4 | 1¼ | | 4 |
| | | 5.5 | | 7.5 | 41 | | | 41 |
| 1-B | 10,000 | 2.67 | 1 | 12.5 | 33 | 1¼ | 3.5 | 9 |
| | | 7.5 | | 24.5 | 183 | | 7.5 | 56 |
| B-H | 30,000 | 10.7 | 1½ | 12 | 128 | 1½ | | 128 |
| | | 4.5 | | 35 | 157 | | | 157 |
| Total | | | | | 772 | | | 621 |

Note: All calculations made with a slide rule.

CIRCUIT II

Pressure-head = 17 x 90 = 1530 m. i.

| Section | B.T.U. | Feet Elbows | Assumed Diameter | Unit Friction | Total Friction | Selected Diameter | Unit Friction | Total Friction |
|---|---|---|---|---|---|---|---|---|
| H-A | 30,000 | 8.67<br>3.5 | 1½ | | 104<br>122 | 1½ | | 104<br>122 |
| A-C | 20,000 | 10<br>0 | 1¼ | 12 | 120 | 1 | 46 | 460 |
| C-2 | 8,000 | 1.2<br>5.5 | 1 | 8.5<br>15.5 | 10<br>85 | 1 | | 10<br>85 |
| 2-D | 8,000 | 2.67<br>7.5 | 1 | 8.5<br>15.5 | 23<br>116 | 1 | | 23<br>116 |
| D-B | 20,000 | 10<br>0 | 1¼ | 12 | 120 | 1-6 Ft.<br>1¼ 4 Ft. | 46<br>12 | 276<br>48 |
| B-H | 30,000 | 10.7<br>4.5 | 1½ | | 128<br>157 | 1½ | | 128<br>157 |
| Total | | | | | 985 | | | 1529 |

a size, calculate the corresponding friction-head, and compare it with the available pressure-head; if the two are equal, the assumed size is the correct one; if they are not equal, we assume a different size and repeat the calculation until we have found the correct size.

In order to have some idea regarding the proper size required, we may first assume that the friction-head is to be uniformly distributed over the entire pipe line of the circuit. We note that the length of the pipe line of Circuit I is 8.67 + 1.20 + 2.67 + 10.7, or 23.24 ft.; we note also that there are 21 elbow equivalents in the circuit; since the friction-head due to one elbow is, approximately, twice as large as that due to 1 ft. of pipe, as may be seen by inspection of Diagrams II and III, we may say that, approximately, the total circuit is equivalent to 23 + 2 × 21, or 65 ft. of pipe.

Since the available pressure-head is 630 m.i., we should select that pipe size which will give a friction-head of 630 ÷ 65, or 10 m.i. per foot of pipe as our first trial size.

We see from Diagram II (see THE HEATING AND VENTILATING MAGAZINE for January, 1924) that, for 10,000 B.T.U. and a 1-in. pipe, the friction-head is 12.5 m.i. per foot of pipe, and that for 30,000 B.T.U. and a 1½-in. pipe, the friction-head is 12 m.i. per foot of pipe. Both pipes, therefore, are slightly too small, so we try a 1½-in. pipe for Sections H-A and B-H, a 1¼-in. pipe for Section A-1, and a 1-in. pipe for Section 1-B. We record these sizes in the table, as shown, find the unit friction-heads for the several sizes per foot of pipe and per elbow from Diagram II, record the same in the table, calculate the total friction for each section and record it. We add the several items and find the total friction-head to be 772 m.i. and record it.

Since the total friction-head is considerably more than the available pressure-head, it will be necessary to increase the pipe size of one or more of the sections. An inspection of the friction in the several sections shows clearly that the least expensive and most effective change will be to enlarge the pipe size of Section 1-B from 1 in. to 1¼ in. We will do this and make corresponding friction-head calculations and record the results in the table.

The total friction-head is now 621 m.i. This is so near to 630 that we consider the selected pipe sizes satisfactory.

### FIGURING PIPE SIZES FOR CIRCUIT II

We can now proceed to the design of Circuit II, which is divided into six sections: H-A, A-C, C-2, 2-D, D-B and B-H. Of these six sections, H-A and B-H are fixed by the design of Circuit I. We prepare a table and proceed with the design of the circuit exactly as we did for Circuit I. We note that the available pressure-head is 1530 m.i. and that, of this head, Section H-A consumes 226 m.i. and Section B-A, 285, leaving 1530 — 511, or 1019 m.i. for the four remaining sections.

The combined equivalent pipe length of these four sections is about 50 ft.; the average unit friction is about 20 m.i. per foot of pipe. An inspection of Diagram II shows that, for a unit friction of 20 m.i. and 8,000 B.T.U., a ¾-in. pipe is too small and a 1-in. pipe too large; also that, for 20,000 B.T.U., a 1-in. pipe is too small and a 1¼-in. pipe too large.

We will select a 1-in. pipe for Sections C-2 and 2-D and a 1¼-in. pipe for Sections A-C and D-B, and proceed as for Circuit I. We find that the total friction-head would be only 985 m.i., or 545 m.i. less than the available pressure-head. We must, therefore, replace the pipe of one of the four sections by a smaller pipe. We can replace the 1-in. pipe in Section C-2 or 2-D by a ¾-in. pipe, or we can replace the 1¼-in. pipe in Section A-C or D-B by a 1-in. pipe.

To calculate how many feet of the 1¼-in. pipe must be replaced by 1-in. pipe, in order to consume the 545 m.i. excess pressure-head, we must know the friction due to 1 ft. of 1¼-in. pipe when 20,000 B.T.U. are being conveyed through the same. We find that Diagram II has not sufficient range to give this information. We turn, therefore, to Diagrams IV and V, which are drawn to logarithmic co-ordinates and have a much larger range than

### HOW TO USE DIAGRAMS IV AND V

To understand the use of Diagrams IV and V,

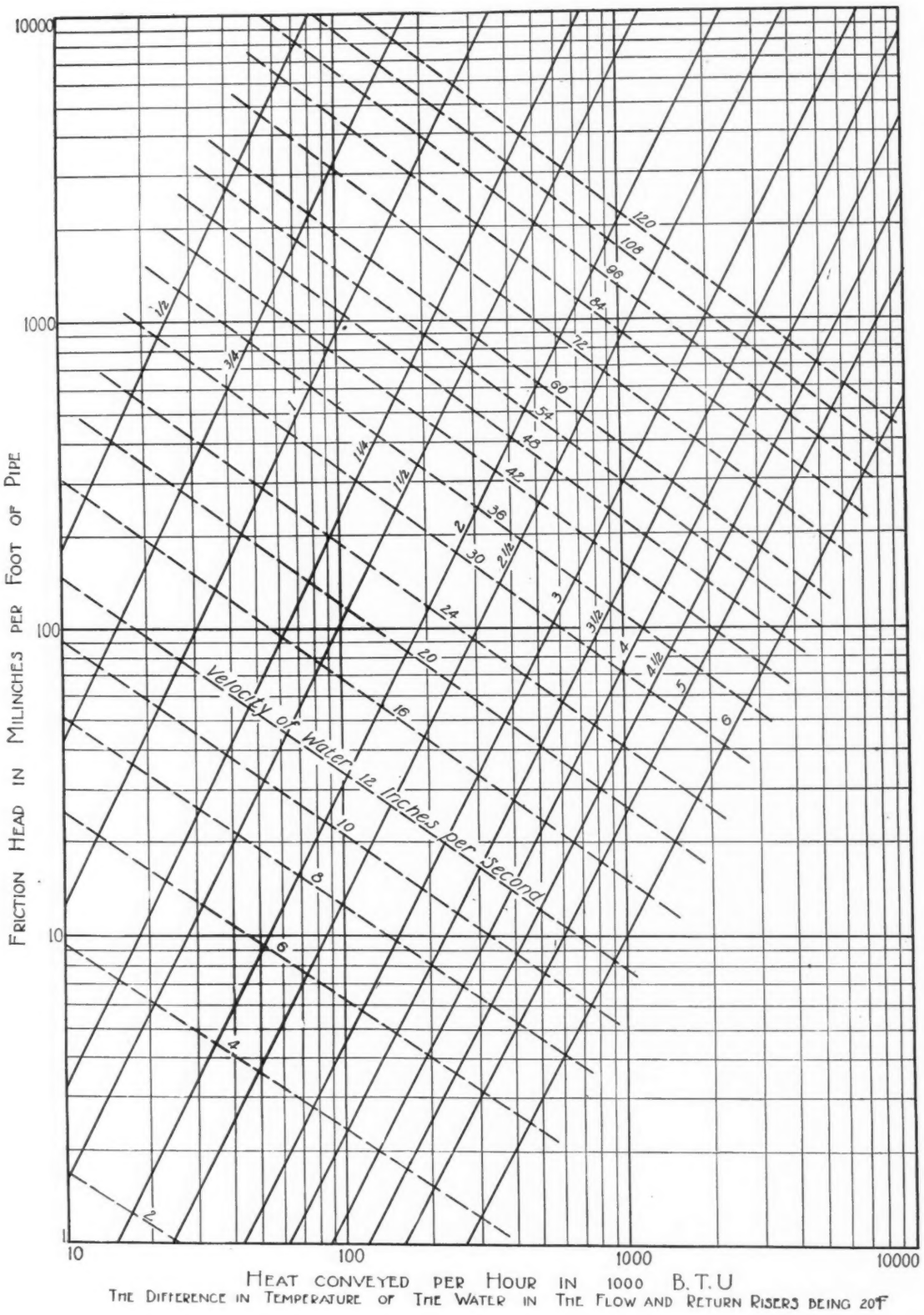


**Diagram IV. For Finding Friction-Heads in Pipes**

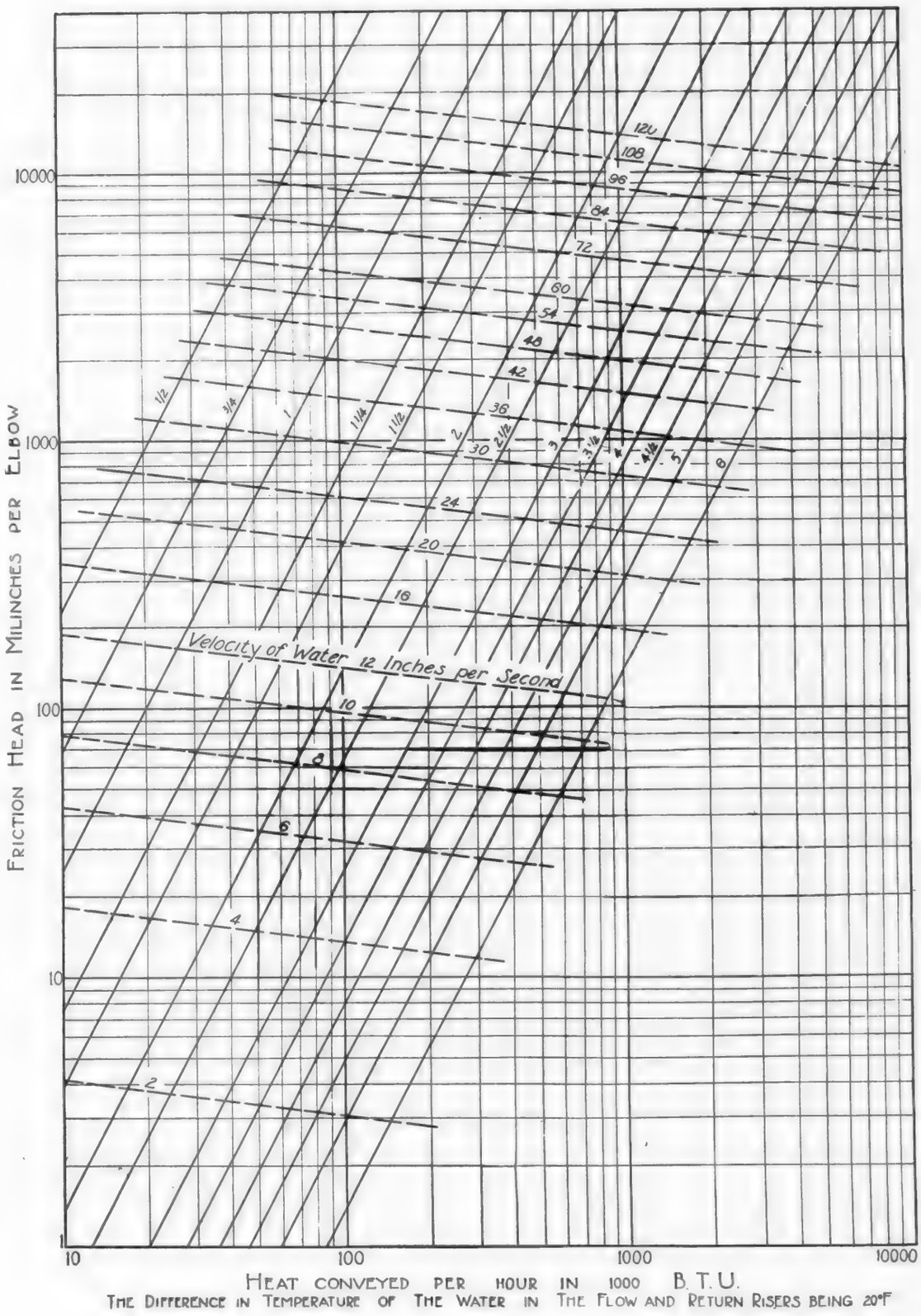


**Diagram V. For Finding Friction-Heads in Elbows**

CIRCUIT III

Pressure-head = 27 x 90 = 2430 m. i.

Friction-head of Sections A-C = 226
C-E = 460
D-B = 324
B-H = 285 1295

Available Pressure-head = 1135 m. i.

| Section | B.T.U. | Feet Elbows | Assumed Diameter | Unit Friction | Total Friction | Selected Diameter | Unit Friction | Friction |
|---|---|---|---|---|---|---|---|---|
| C-E | 12,000 | 10<br>0 | 1 | 17.5<br>35 | 175 | 1 | | 175 |
| E-3 | 12,000 | 1.2<br>4.5 | 1 | | 21<br>157 | ¾ | 60<br>100 | 72<br>450 |
| 3-F | 12,000 | 2.67<br>6.5 | 1 | | 47<br>227 | 1 | | 47<br>227 |
| F-D | 12,000 | 10<br>0 | 1 | | 175 | 1 | | 175 |
| Total | | | | | 802 | | | 1146 |

note first from Diagram II that for 20,000 B.T.U. and a 1¼-in. pipe, the unit friction is 12 m.i. per foot of pipe and 30 m.i. per elbow; then note from Diagrams IV and V that the same values are shown there. Having done this, note from Diagram IV that, for 20,000 B.T.U. and a 1-in. pipe, the friction-head is about 46 m.i. per foot of pipe and note from Diagram V that the friction-head is 100 m.i. per elbow.

Since there are no elbows in Sections A-C and D-B, we note that by changing from a 1¼-in. to a 1-in. pipe we increase the friction-head from 12 to 46 m.i., or 34 m.i. per foot of pipe. To consume the 545 m.i. of excess pressure-head we must replace 545 ÷ 34, or 16 ft. of 1¼-in. by 1-in. pipe. Ordinarily we would, in such a case, use 1-in. pipe for one section and 1¼-in. for the other. In the present case we will select 1-in. pipe for Section A-C and build up Section D-B of 6 ft. of 1-in. pipe and 4 ft. of 1¼-in. pipe. We can then complete the table as shown, and will find that the friction-head of Circuit II is equal to the available pressure-head. Radiator II will then receive 8,000 B.T.U. when Radiator I receives 10,000 B.T.U.

The effect on Section D-B of replacing 6 ft. of 1¼-in. pipe by 6 ft. of 1-in. pipe is exactly the same as that of inserting a 1¼-in. gate valve and partly closing it, with the distinction, however, that the substitution of 1-in. pipe for 1¼-in. pipe is much cheaper than the addition of a gate valve and the further distinction, that the adjustment made by the substitution of the 1-in. pipe can not be tampered with as can be the setting of a valve.

### DESIGN OF CIRCUIT III

We are now ready to design Circuit III. We note that it consists of Sections H-A, A-C, C-E, E-3, 3-F, F-D, D-B and B-H. We note also that Sections H-A, A-C, D-B, and B-H have been fixed by the design of Circuits I and II. It is not necessary to include these four sections in the table of calculations; it is easier to deduct the friction-heads in the same from the pressure-head of Circuit III and record only the remaining four sections and the pressure-head available for them in the table as shown.

A trial of 1-in. pipe for all four sections shows that the friction-head would be about 333 m.i. too small. By changing the pipe in Section E-3 from 1-in. to ¾-in., the friction-head becomes practically equal to the pressure-head.

To calculate the friction-head for a ¾-in. pipe conveying 12,000 B.T.U., we must refer to Diagrams IV and V.

These diagrams can be read with fair accuracy, by simple inspection, after one has become accustomed to reading logarithmic diagrams. If greater accuracy is desired a logarithmic scale should be used. Such a scale may be cut from a sheet of logarithmic cross-section paper, or it may be constructed with the aid of the scale on a slide rule. It must, in general, be applied diagonally across the diagram in order that the division points of the scale may fall on the division lines of the diagram. It will be found, from the diagrams, that for a ¾-in. pipe and 12,000 B.T.U. the unit friction-heads are, respectively, 60 m.i. per foot of pipe and 700 m.i. per elbow.

We may now design the three radiators. In each of the three cases the average temperature of the water within the radiator is 190° F.; the temperature of the surrounding air is 70°; the temperature difference is 120°. If we decide to use 3-col., 38-in. radiators, we note from Fig. 3 that the corresponding value of k is 1.33. The heat dissipated per square foot, per hour, is 133 × 120, or 160 B.T.U. The correct sizes are: Radiator I, 10,000 ÷ 160, or 62.5, or 65 sq. ft.; Radiator II, 8,000 ÷ 160, or 50 sq. ft.; Radiator III, 12,000 ÷ 160, or 75 sq. ft.

*The next section will explain the design of two-pipe systems with direct and with reversed return*

# The Fallacy of "Air Change" Factors in Figuring Heating Requirements

## Evolution of a Commonly Used Method of Estimating Air Leakage, with Reasons for the Adoption of "Air Infiltration" as a Basis

*By Alfred M. Lane*
*President, Monarch Metal Products Company*

THE HEATING business of to-day owes its success to the salesmanship of the early days, more than it does to science. The more successful a salesman was in selling heating plants, the more successful the designers became through the school of experience. It was common knowledge that heat had to be applied to a substance to raise the temperature. Everybody knew that the outside walls or the window glass were colder than the air that surrounded them. The amount of "cold" (using the terminology of those days) that was transmitted through a unit of wall or glass was unknown (and, for that matter, up to quite recently was still unknown), but it was easier to reason out some factors upon which to base calculations. After these factors were determined and, for the time being, accepted, another factor became apparent and that was the heat loss due to air leakage. It was about this time that the misnomer "air change" was adopted. What was really meant was air replacement or air diffusion. In the venacular of to-day, it meant infiltration.

On account of the high ceilings, the large rooms and the few windows which were formerly standard practice, it was assumed that the temperature of the air in the room would be changed to the temperature of the air outside a certain number of times per hour, due to the displacement of the warm air by the cold air. Therefore, sufficient heat had to be supplied to resist this change of temperature by the same process of experimenting that led to the acceptance of heat losses through walls and glass. The number of so-called air changes was increased or decreased to meet the various conditions.

This theory of computing heat losses by air change is responsible for the lack of knowledge of the effect of air temperature change on the size of the heating apparatus. If our forefathers had christened the air factor "infiltration," instead of "air change," it is logical to believe that we would have known at least as much about heat losses due to air infiltration as we do about heat losses through wall and glass.

### HOW MODERN CONSTRUCTION MODIFIED "AIR CHANGE" FACTORS

Then times began to change. Buildings were made more practical; the value of light was more appreciated, building materials were being standardized and, consequently, our high ceilings were lowered and the size of the rooms was reduced. Therefore, the cubical contents of the rooms were materially decreased.

In the meantime, however, more windows were added, and for each unit of cubic contents reduction, there was a corresponding increase of infiltration, due to the increase in the number of windows; but the engineer did not change his old-time factor and probably would have continued to guess at his radiation, it is had not been for an enterprising American institution of international reputation which demanded of its architects and engineers, the reason for the failure of a heating plant designed by an exceptionally capable and well-informed engineer under the direction of an equally capable architect. This led to the first, real scientific investigation of infiltration around windows and doors which was conducted by Messrs. Voorhees and Meyer. The result of this investigation was published in the Transactions of the A. S. H. and V. E. in 1916. (Reported in detail in THE HEATING AND VENTILATING MAGAZINE for April, 1916).

### HOW RECENT TESTS ON AIR INFILTRATION WERE STARTED

The facts brought out in this test were sufficient to prove that a large majority of heating plants in modern structures of the office-building type, must be taxed to their capacity to get the amount of heat necessary to provide warmth and comfort. From that day up to the present time, there has been an insistent demand for more accurate information on infiltration. Recognizing this demand, the Structural Service Committee of the American Institute of Architects, by agreement with the Research Bureau of the American Society of Heating and Ventilating Engineers, undertook a series of investigations, under a code submitted by the Structural Service Committee of the A. I. A. The report of these investigations was made in a paper on "Air Leakage Through the Openings in Buildings," by Messrs. Houghten and Schrader, presented at the annual meeting of the A. S. H. and V. E. in New York in January, 1924. (Reported in detail in THE HEATING AND VENTILATING MAGAZINE for February, 1924).

If there is any value in research at all, the results brought out in this test should be conclusive evidence of the fallacy of determining radiation on anything but known factors.

### PREPARATION OF TESTING CODE

To conduct a test that would be acceptable and upon which all subsequent investigation should be

based, it was necessary to prepare a code covering: (a) the method of testing and (b) the construction of the sash and frame to be tested. It was a comparatively easy matter to determine on a method of testing, as this only involved the discharge of air against the sash and frame at various velocities, employing accepted accurate instruments for measuring the volume and velocities.

The conditions of the window sash and frames, however, were not so easily determined. In the first place, it was necessary to ascertain from reliable sources what was the commercial practice for allowances in the run-way of the frames to permit easy operation of the sash. In other words, how much variation was there between the thickness of the sash and the width of the run-way between stops and parting bead. In the second place, it was necessary to determine the degree of shrinkage over a period of years.

### MINIMUM CRACK DETERMINED FROM EXPERIENCE OF TWENTY MILLS

A cross-section detailed drawing through the side rail and box of a double-hung window was made and sent to twenty leading mills in different localities throughout the country, with the request that they fill in the dimensions. The replies of these mills point to the fact that the minimum clearance is 1/16 in. Therefore, by this general mill practice, a minimum crack of 1/16 in. was established before any shrinkage took place.

The report of Messrs. Houghten and Schrader gives the leakage through this size crack at a wind velocity of 14.4 miles, as 46 cu. ft. of air per minute for the whole window, or 151.8 cu. ft. of air per lineal foot of crack per hour.

### HOW DEGREE OF SHRINKAGE WAS DETERMINED

The next question was to determine the degree of shrinkage. This was done by sending the same drawings furnished to the planing mills, to twenty universities where actual measurements of windows were taken. Sixteen windows in all were measured—four each on the north, east, south and west sides. The time the windows had been in place was also given. This time varied from 5 to 30 years. The minimum difference was 3/32 in. and the maximum was 5/32 in.

### CLEARANCE GENERALLY ALLOWED IN FITTING SASH TO FRAME

The next step was to ascertain the clearance allowed by the average skilled mechanic in fitting the sash to the frame. In other words, to find out what was the common practice in the trade for fitting a ash. Upon investigation, it was found that because a frame was set up first and the brick work laid around it, the frame absorbed considerable moisture from the mortar and also from being exposed to the elements. This caused considerable swelling in the frame itself; the vertical members bowing in at the center in some cases as much as ⅛ in. on each side. When it came to fitting the sash to a frame in this condition, it was necessary to dress the sash down so that it would pass the narrowest point, which was at the center of the frame. The mechanic would leave a clearance of 1/16 in. on each side.

### SPECIFICATIONS OF TESTING CODE

From these data, a code describing the dimensions of a crack was prepared as follows:

"Double hung window cracks will be accepted as standard with a minimum of 1/16 in. and a maximum of ¼ in. on each side between the sash and pulley stile of frame; cracks between sash and guide members (inside stops, parting bead and blind stops) shall be accepted as standard with a minimum crack of 1/32 in. on each side of sash and a maximum of 3/32 in. on each side of the sash. The cracks between frame and sash at head and sill shall be a minimum of ⅛ in. and a maximum of ¼ in.

Casements—minimum on hinge side ⅛ in. maximum ¼ in. Meeting rail, head and sill, minimum 1/16 in. maximum ⅜ in.

Doors—minimum crack on hinge side ⅛ in., maximum ¼ in. Same at head. Lock side, minimum ⅛ in. at outside corner, maximum ⅜ in. Sill, maximum ¼ in.

(Minimum cracks on the hinge side of all hinged openings is established to prevent hinge binding.)"

Cracks duplicating the cracks due to normal and natural conditions were created by dressing down the edges of the sash and adjusting the stops away from the faces of the sash, beginning with a minimum of 1/16 in. and a maximum of ¼ in. crack between the edges of the sash and the frame and a minimum crack of 1/32 in. and a maximum of 5/64 in. between the faces of each of the stops. Tests were then made at various velocities ranging from 5 to 50 mils per hour.

### SUMMARY OF TEST RESULTS

Using a window having identical cracks, a rib or tongue-type of weather strip was applied. This type of strip is nothing more than a tongue or rib attached to the frame and projecting into a groove plowed into the edge of the sash. The results of this test showed a remarkable reduction in infiltration for the smallest-size crack; but as the crack was increased to represent shrinkage, there was a very marked increase in infiltration, proving that the effect of the strip depended on the tightness of the sash and not on the strip itself. The reason for this is that there was no provision for contact between the sash and the strip during the process of shrinkage.

After the test on the rib strip was completed, an interlocking two-member adjustable strip, of the Monarch type, was applied. The results showed that the leakage through the maximum crack of ¼ in. was three-sevenths greater than the leakage

through the 1/16 in. crack, while with the rib strip the leakage through the ¼-in. crack was just twice the leakage through the 1/16-in. crack.

### A TYPICAL CASE OF THE VARYING RESULTS OBTAINED BY FIGURING ON THE "AIR CHANGE" BASIS

To illustrate the foregoing argument on the use of the "air change" basis in figuring radiation, let us assume a room with only one window of standard size, 3 ft. by 6 ft. The crack perimeter would be 21 lin. ft., and with the infiltration at 151.8 cu. ft., the total leakage would be 3188 cu. ft. per hour. To figure on a displacement of air two times per hour, and assuming the height of the room to be 9 ft., the minimum-size room would have to be 15 ft. by 16 ft. If this same room should have two windows, it would have to be 24 ft. by 30 ft., in order to get the same displacement.

The point is this—that the cubical contents factor is relative to the crack perimeter. By the use of suitable weather stripping, the ratio of cubical contents to the crack perimeter can be reduced from 72% to over 81%.

### PROVIDING FOR CHANGES IN WIND DIRECTION

It is manifest that the consumption of fuel cannot be based on infiltration, because infiltration is dependent on the direction of the wind and its velocity. Therefore, not more than 50% of a building will be exposed to infiltration through windows at a given time. The windows in the building on the opposite side from which the wind is blowing, would not be subject to infiltration. From the standpoint of consuming fuel to heat the air that leaks in, there would be none. However, the wind does not always blow from the same direction and as radiation cannot be changed from one side of a building to the other, when the wind changes, it would be necessary to figure the radiation on all four sides of the building in order to provide for heat losses due to infiltration.

Once the radiation is determined, it is an easy matter to calculate the amount of fuel necessary to keep the radiation at the proper temperature. Consequently, the economy of fuel consumption must be based on the economy of radiation installation.

In conclusion, the author wishes to urge upon the heating and ventilating engineering profession in particular, from the standpoint of figuring radiation; and upon the architects from the standpoint of the economical operation of a heating plant, to abolish all references to "air change" because air is a combination of elements and therefore not subject to change except as to its state.

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# Our Artificial Winter Climate

*By Paul W. Goldsbury, M. D.*

AS a student of hygiene, I have long wondered why the subject of humidity did not receive more attention from hygienists and medical men. We give elaborate concern to the life and habits of the pathological germ or bug and to serums and toxines, using all the modern aids to scientific investigation—the microscope, test tube, etc., but in this intensive sort of study, seem to lose sight of certain more gross conditions which plainly make human tissue a prey to such insidious foes. In studying a graphic showing of the ills and ailments of mankind by months, the winter time seems to record the greatest amount of sickness. With the starting of fires in October and the closing of windows, the wave of affections and infections begins to rise to a peak along in January and February, and then to decline until windows are opened and the fires go out, in May.

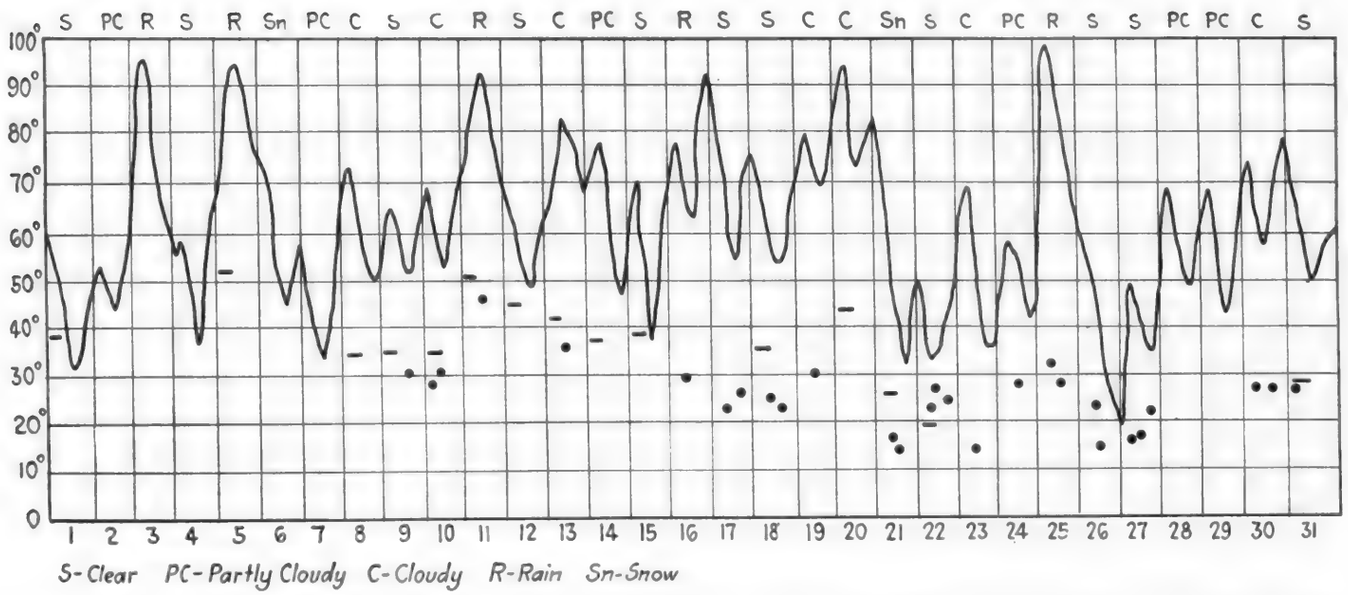
Professor Miller of the Massachusetts Institute of Technology gives me the figure that of all the affections recorded there among the students, during a recent year, 78% were of respiratory character. The question is an obvious one, then, to a student of ventilation. How far does the character of the air render mucous and other delicate surfaces a prey to infections?

### A STUDY OF TEMPERATURE AND HUMIDITY VARIATIONS IN OUTDOOR AIR

The recorded graphs of outdoor temperature in degrees show daily wave-ebbs and flows, usually within a range of 20° to 40° F. for 24 hours. Each month has its characteristic level ranging, say, from below 30° in January to above 70° in July, and then back. Now, when we study a graph of humidity percentages, we find waves more marked and one month may not differ so much from another. The chart here shown records relative humidity, morning, noon and night, in Boston for the month of January, 1924. There are six days in which the relative humidity was above 90%, and four of these were rainy. Note that on but one day did the relative humidity go below 30%, and, then, on the 26th, it took an unusual drop to 19%.

### COMPARISON OF OUTDOOR AND INDOOR HUMIDITY VARIATIONS

Now, I have recorded on this same chart by dots and dashes, some indoor readings of humidity percentages made with a sling psychrometer. The dashes represent early morning readings and are something of an index to the humidity per cent. of the air in which I had slept. I endeavored to favor the rise of humidity by shutting off the radiators and opening the windows. Two of these dash readings, made on the second and fifth day, are above 50%. I was then living in an apartment insufficiently heated. It was often difficult to get the temperature there much above 50°. The dashes made afterward are mostly below 40%. I had moved to an apartment which was overheated and


S PC R S R Sn PC C S C R S C PC S R S S C C Sn S C PC R S S PC PC C S
100°
90°
80°
70°
60°
50°
40°
30°
20°
10°
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
S-Clear PC-Partly Cloudy C-Cloudy R-Rain Sn-Snow

**Comparison of Outdoor and Indoor Temperatures and Indoor Relative Humidities in a Typical American Home During January, 1924.**

it was difficult to get the night temperature below 60°, and so get a more agreeable humidity.

The dots include readings in my own apartment, in various offices, in the corridor of a medical and other library, and in two of the most modern types of buildings. The dots, therefore, represent typical indoor humidities during working hours for the month of January. If these are connected together, the range of wave, for the most part, is between 10% and 20%, whereas the outdoor humidity graph shows from 20% to 80%, a mean near 70%, while the indoor mean is below 30%.

### CAUSES OF HIGH INDOOR TEMPERATURES

Winter indoor atmospheres undoubtedly are too dry. From the many observations taken during the past two years, I have been impressed by the high range of temperatures found, endured or required. The older person in a room requiring a higher temperature may dominate, as regards the atmosphere. The younger women are following fashions that require a very scant amount of clothing, so they require higher temperatures than the men whose clothing has not yet been subject to such reductions. Age, fashions, habits very much complicate this matter of heat regulation.

### FLUCTUATIONS IN ALL CONDITIONS OF LIFE THE RULE

A study of physical phenomena, of physiology, of metabolic processes, should suggest how prevalent is this wave, like fluctuations in all conditions of life. How far are we disregarding it in artificial atmospheres?

We regulate temperatures within buildings to protect from the rigors of winter by an engineering arrangement, but this course has not satisfactorily met the moisture requirements. It is simple to heat air, but difficult to insure a harmonic moisture content when the air is being heated. Our winter indoor atmospheres seem to mean an over-high and too even temperature, very dry air and too few fluctuations from that dryness. Florida in winter gives the heat and humidity variations that we enjoy in the summer when we live out-of-doors or can keep our windows open. Even Arizona would give more temperature and humidity variation than our artificial heating and ventilation affords in this northern clime.

The true hygienist and physiologist must value the influence of the ebb and flow principle upon the human tissues, the skin, the disposition. It helps to mold and weave the texture, prevents undue relaxation; in short, tends to develop a tone that is more resistant to unwholesome invasions.

Nature is always subject to waves, to moods; a complex of forces is always at work. In candy-making, the drying process; in bread-making, the baking process; and in cotton-weaving, the air-moistening process all have their distinct services. In human textural upkeep and health development, we should avoid an excess of either and allow for ranges in all.

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Investigation of a certain chemical compound, the spraying of which in garages was claimed to reduce the danger of carbon monoxide poisoning from exhaust automobile gases, made by the Department of the Interior chemists at the experiment station of the Bureau of Mines in Pittsburgh, it is announced, fails to substantiate the claims of the manufacturers. The compound, it was found, does not absorb carbon monoxide from garage atmospheres, consequently the spraying of this solution around garages, according to the investigators, does not decrease the hazard or danger of poisoning from the inhalation of exhaust gases from automobiles. Details of the tests are given in Serial 2594, by A. C. Fieldner and W. P. Yant, which may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

# Back To First Principles

## Plain Answers to Direct Questions on Present-Day Heating and Ventilating Practice

*By T. W. Reynolds*

(*Continued from the April issue*)

In view of the statements made from time to time which indicate forgetfulness or misunderstanding of the physical laws underlying the practice of heating and ventilating, it is worth while now and then to review the principles of physics, at least in their relation to the properties of steam and the conditions of heating under a vacuum, so-called. Although books on physics treat of these laws in a general way, yet they seldom point out their direct application to heating, hence it is hoped the accompanying notes and illustrations will be of help in refreshing the memory on matters which form the basis of present-day practice in heating.

27. Q. *What is meant by heat and cold?*

A. Heat (thermal energy) is a form of energy produced by the motion or vibrations of minute particles (molecules) of a body. These particles are in a continuous state of vibration, the rate of which increases with the temperature of the body. Though vibrating and tending to separate, yet they are bound together by an opposing force called "mutual cohesion."

Remove all heat from a body until its temperature reaches the absolute zero of temperature and all vibrations of its molecules will cease. On the other hand, we may add heat to a body until the vibrations of the molecules become so active that not only the force of attraction between them is overcome, but also the resistance to change in volume of the body as it expands in order to give the molecules more room for their increased vibrations. When this is done the body loses its form, undergoing a change of state, as, for example, when water is converted into steam.

Heat being a form of motion, is capable of being converted into mechanical motion. For example, the heat units required to raise 1 lb. of water from 32° to 212° F., multiplied by the mechanical equivalent of heat will give the foot-pounds of work which this amount of heat can do, thus, $1{,}150.4 \times 778 = 895{,}011$ ft. lbs. This is equivalent to the foot-pounds of work which would be required in order to raise a weight of one ton to a height of 447.5 ft.

Cold is a convenient term used in the same way as the term heat is used and often as though it meant something different from heat, yet cold is but an absence of heat. When we open an outside door in a heated room we do not let the cold in so much as we really let the heat out.

28. *Q. What is kinetic energy?*

A. Heat vibrates the particles of a body. The same amount of energy is required to stop these vibrations, hence the body possesses a form of activity or energy which because of its moving force is called kinetic energy. Increase in temperature of water as heat is added to the water is an evidence of molecular kinetic energy.

29. *Q. What is potential energy?*

A. Potential energy is the energy stored up in a body due to its position. The energy required to elevate or move it to that position is given up again when the body returns to its original position. For example, when a weight is thrown in the air it possesses kinetic energy or moving force because of its motion. As it rises it loses kinetic energy and acquires an equal amount of energy of position until at the highest point the kinetic energy is entirely transformed into potential energy. Reversing the cycle, the weight falls to the ground, losing energy of position and gaining kinetic energy.

In the same way, when water passes into steam, some of its heat becomes latent or apparently disappears, only to reappear as sensible heat in the water when the steam is condensed and so returned to its original state. The heat which disappeared was converted into the work of separating the particles of water against mutual attraction and in overcoming the resistance of the surrounding pressure to change in volume as the water evaporated. Potential energy is then stored up in the steam until such time as the removal of heat from the steam decreases the amount of potential energy to the point where it is overcome by the surrounding pressure and forces of attraction, at which time the steam condenses, the volume decreases, and the molecules come together again as water.

30. *Q. What is meant by the "heat of the liquid"?*

A. The heat of the liquid is the amount of heat required to raise 1 lb. of water from 32° F. to the temperature corresponding to the boiling point of the water. At this point the temperature no longer increases, even though heat is added and the water converted into steam.

The heat of the liquid may be considered as kinetic energy as very little heat is required in the form of potential energy. Nearly all of the energy required to raise the temperature appears as sensible heat in the water, the heat required for the external work of expanding the water against pressure being but very little, due to the slight increase in volume.

The heat of the liquid is measured above 32° F. It is often referred to as sensible heat because it is sensible to the touch as compared with latent heat which cannot be felt. Sensible heat can be measured by a thermometer.

31. *Q. What is the temperature of the ebullition or boiling point of water?*

A. The temperature at which the application of additional heat no longer serves to increase the temperature of the water. The additional heat disappears as sensible heat and becomes latent, being absorbed in the conversion of the water into

steam. The point at which this change takes place depends upon the activity of the particles of the water due to their temperature, which in turn depends upon the pressure under which the water evaporates, hence the water has a boiling point corresponding to each pressure or temperature.

32. *Q. What is meant by latent heat of steam?*

A. The additional heat energy which must be absorbed by the molecules of the water during ebullition in order to evaporate the water into steam is called "latent heat." Though disappearing as sensible heat, the latent heat is not lost, for it appears in the work of effecting a change of state. This is the work which must be done in order to overcome the forces of cohesion and increase the volume of the water against the pressure as the particles of water are forced farther apart. When steam returns to its original state (condenses as in a radiator) the heat reappears and is given up.

Latent heat cannot be measured by a thermometer; as it produces no change in temperature, either when the water changes to steam, or the steam to water (See Fig. 23). Hence, this heat is called latent, meaning to lie hidden or concealed. The amount of the latent heat depends upon the pressure surrounding the water.

33. *Q. What is the cause of latent heat of evaporation?*

A. Latent heat is divided into two parts; the internal latent heat and the external latent heat.

The internal latent heat is the heat required to do the work of separating the particles of water from each other so that they may change into steam. This energy would not be required were it not for the attractive force tending to bind or bring the molecules together. Unlike the force of gravitation the force of attraction is exerted only at very small distances. It is for this reason that heat is required to increase the vibratory motion of the molecules and so alter their position that the attractive force is no longer appreciable. This work is done internally or within the body of water.

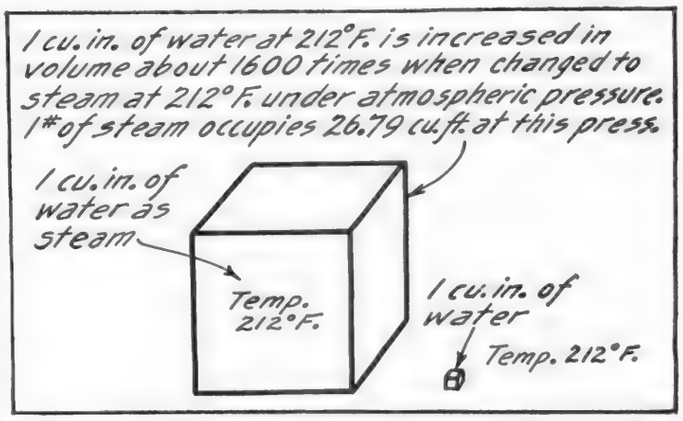
1 cu. in. of water at 212° F. is increased in volume about 1600 times when changed to steam at 212° F. under atmospheric pressure. 1# of steam occupies 26.79 cu. ft. at this press.
1 cu. in. of water as steam
Temp. 212° F.
1 cu. in. of water
Temp. 212° F.

**Fig. 24. Relative Volume of Steam and Water at 212° F., Showing Large Increase in Volume As Water Changes to Steam**

External latent heat is the heat energy required to overcome the resistance which the steam pressure acting on the surface of the water offers to increase in volume of the steam during its generation. Thus, when water under atmospheric pressure turns into steam at a temperature of 212°F., the volume is increased about 1,600 times. For example, as shown in Fig. 24, 1 cu. in. of water under these conditions must occupy 1,600 cu. in., or about 1 cu. ft., of space as steam, so that work must be

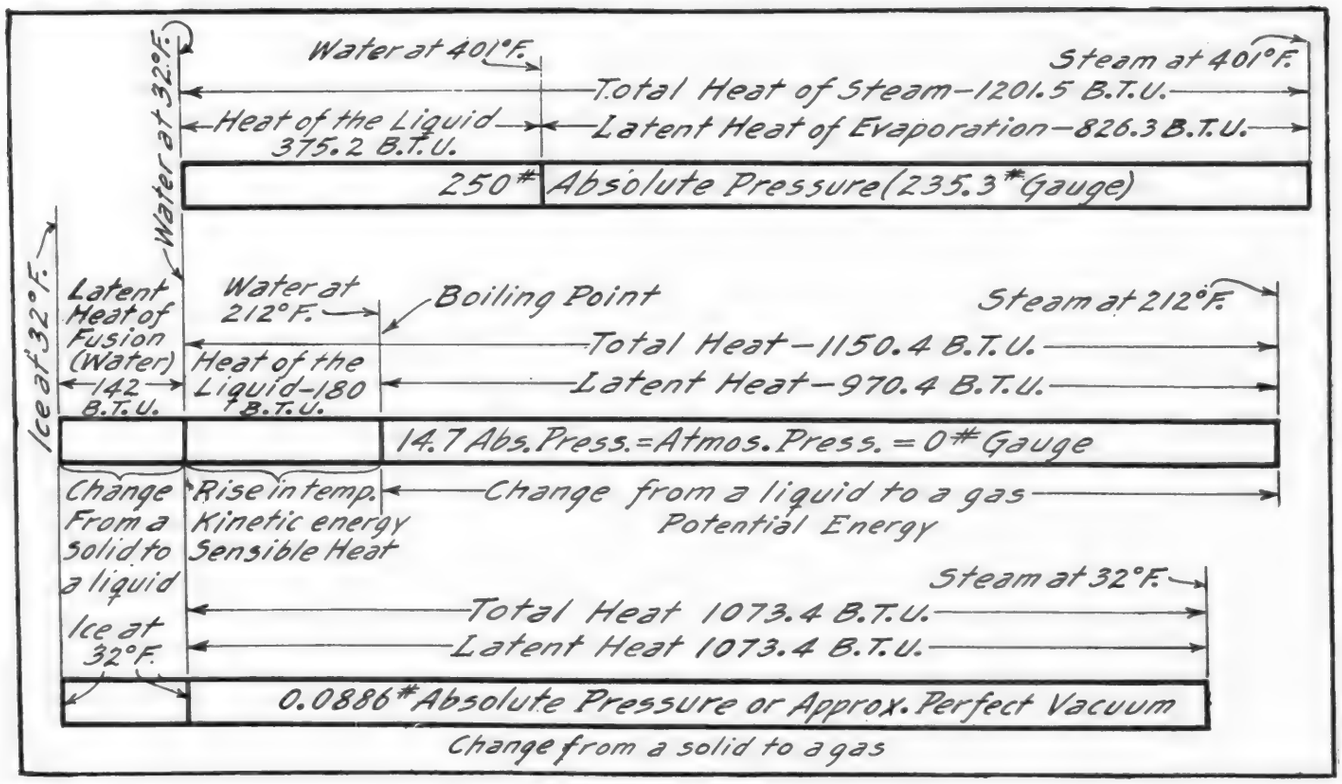
Water at 32°F.
Water at 401°F.
Steam at 401°F.
Total Heat of Steam—1201.5 B.T.U.
Heat of the Liquid 375.2 B.T.U.
Latent Heat of Evaporation—826.3 B.T.U.
250# Absolute Pressure (235.3# Gauge)
Ice at 32°F.
Latent Heat of Fusion (Water) 142 B.T.U.
Water at 212°F.
Boiling Point
Steam at 212°F.
Heat of the Liquid—180 B.T.U.
Total Heat—1150.4 B.T.U.
Latent Heat—970.4 B.T.U.
14.7 Abs. Press. = Atmos. Press. = 0# Gauge
Change From a Solid to a Liquid
Rise in temp. Kinetic energy Sensible Heat
Change from a liquid to a gas Potential Energy
Ice at 32°F.
Steam at 32°F.
Total Heat 1073.4 B.T.U.
Latent Heat 1073.4 B.T.U.
0.0886# Absolute Pressure or Approx. Perfect Vacuum
Change from a solid to a gas

**Fig. 23. A Comparison of the Properties of Steam at Different Pressures Showing No Heat of the Liquid and Steam at 32° F. Under Vacuum**

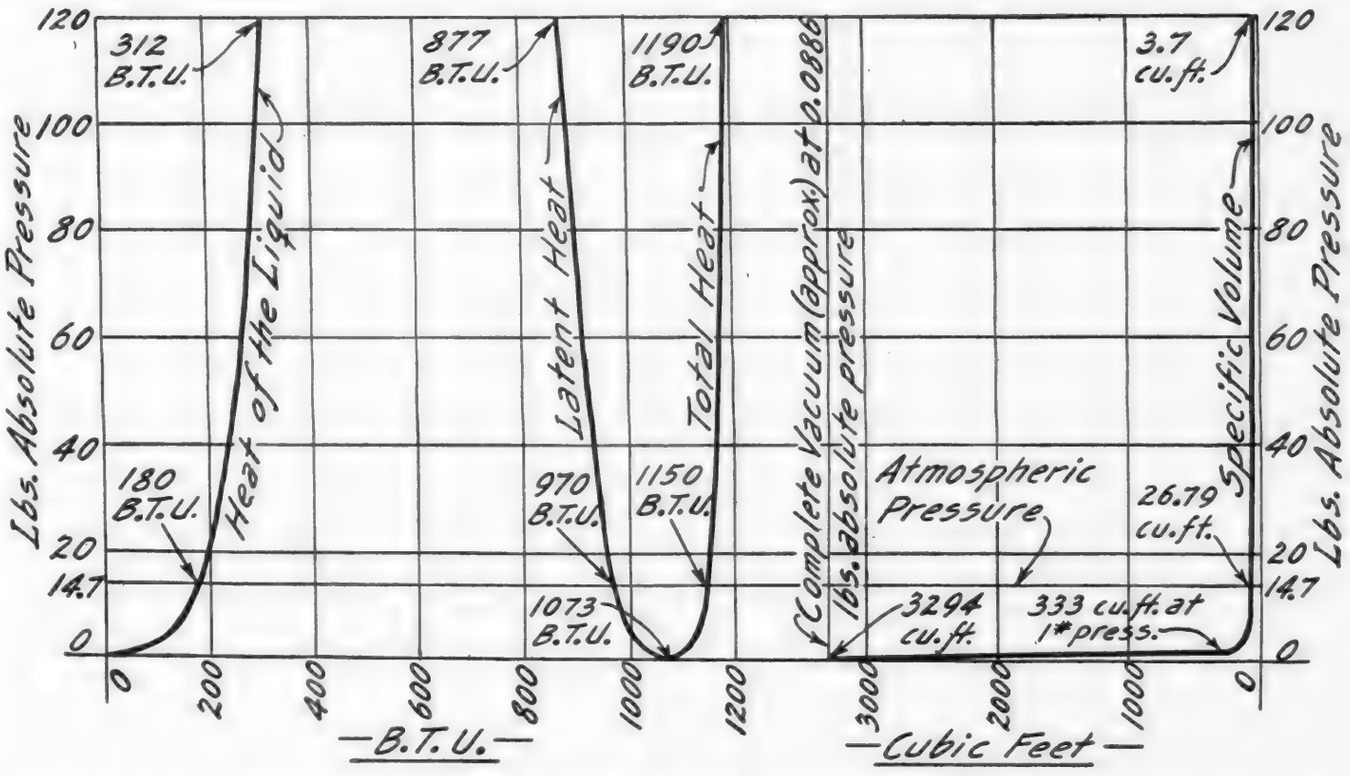


**Fig. 25. A Comparison of the Properties of Steam, Showing Large Increase in Volume and Latent Heat Under Vacuum**

done in pushing back or lifting the surrounding steam through the distance required for expansion. This work is done externally or without the body of water.

Though the pressure, as it increases, compresses the steam into a smaller space, so that the pressure acts on a decreased volume, yet the external work or heat increases with the pressure, because the reduction in volume is not rapid enough to offset the effect of the increase in pressure. On the other hand, the internal heat decreases with the pressure, because the forces of cohesion are diminished by the increase in the temperature of the liquid. The result is a decrease in latent heat as the pressure increases, which is contrary to all other properties of steam (See Fig. 25).

The internal heat is much greater than the external heat. Thus, of the 970 B.T.U. required to evaporate 1 lb. of water at 212° F., 897 B. T. U. must be supplied for the internal heat and 73 B. T. U. for the external heat.

34. *Q. Would steam at the lower pressures be better for heating on account of the large amount of latent heat it contains?*

A. Considering this increase in latent heat, the use of steam at lower pressures would be of decided advantages in heating work as the steam condenses and gives up its heat were it not for its increase in volume. To pass this greater volume, yet obtain the same heat delivery, requires larger pipes, or else greater velocities. Twice the velocity would give four times the friction, as the drop in pressure varies as the square of the velocity. To offset these disadvantages we have only the comparatively slight gain in latent heat per pound of steam and a small decrease in friction, due to the less weight of steam required for the same heat delivery.

The large amount of latent heat required to convert water into steam is an important factor in the heating of buildings. Thus, each pound of steam at a temperature of 212° F. when condensed, as in a radiator, gives up 970 B.T.U., an amount sufficient to supply about 4 sq. ft. of radiation with the heat it transmits to the room hourly (See Fig. 23).

Were it not for this latent heat, larger boilers would be required to store up the same amount of heat. Larger pipe sizes would also be required for equal heat delivery, otherwise the pipes would be required to pass steam at too great a drop in pressure or at higher velocities or temperatures than would be practical. Temperatures might even be so high that radiation losses would be excessive and the fire risk very great.

35. *Q. What is the difference between the latent heat of water and the latent heat of the steam?*

A. Both are heat and both are latent and often confused with one another, but they are different in the amount of this heat and though each effects a change of state, the first is from a solid to a liquid and the second from a liquid to a gas. Thus, at atmospheric pressure, 142 B.T.U. are required to melt 1 lb. of ice at 32° F. into water at the same temperature and 970 B.T.U are required to change 1 lb. of water at 212° F. into steam at this temperature (See Fig. 23).

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SOMETHING of a bombshell has been thrown into the discussion of house-heating boiler ratings through the action of one boiler manufacturer in compiling what are termed "danger red," "practical black" and "true blue" boiler ratings. The "danger red" boiler ratings are those obtained by using the A. S. H. & V. E. standard formula for testing low-pressure heating boilers. These ratings, the company states, are guaranteed under certain given conditions "but," it is added, neither heretofore, nor are they now, recommended."

"Practical black" boiler ratings, as given, are described as the commercial standard catalog ratings which this manufacturer has published in previous catalogs. Finally "true blue" boiler ratings are characterized as giving the most heat with the least fuel and are considerably lower than either the "practical black" or the "danger red" ratings.

In a circular accompanying the new listings and entitled "Boiling Down Boiler Ratings," the company starts off by asking, "Isn't it about time the truth in regard to boiler ratings became common language? The manufacturers know the truth, so do the heating contractors. Why not speak the language?" The circular then goes on to tell how the rating of boilers originated and what happened to bring about the "skyrocketing" of these ratings. "In the early days," it is stated, "the manufacturer designed a model, estimated its capacity, installed a number of the boilers, checked his estimates from these cellar demonstrations, and rated his boiler for so many feet of net radiation. Manufacturers generally were conservative; inclined to rate their product too low, rather than too high, and the heating contractor had the advantage of knowing how many feet of net radiation to put on the boiler without figuring a lot of allowances. Because these ratings were conservative, they became the basis of boiler purchases. When it was established that boilers were sold on ratings, of course some bright party raised his."

The subsequent course of events is likened to the career of an automobile speeder with the terse comment that "manufacturers gave their ratings the gas."

"It is time," declares this manufacturer, "that boilers were rated for efficiency and economy. Coal at present and future prices is a more important factor in heating costs than it used to be. A reasonable increase in the economy and efficiency of a boiler and the yearly saving in fuel expense makes the first cost of the boiler a secondary matter."

So the manufacturer has taken the bull by the horns and states very frankly:

"You will find a danger red rating that can be used if competition compels, with the facts to prove to your customer that such a rating is uneconomical and costly to him in the end" (shades of the A. S. H. & V. E. Boiler Code Committee); or "you will find a 'true blue' rating for those who want the best and are willing to pay a higher price for a boiler so that they may derive the benefit of economy and efficiency ratings. Such a rating guarantees satisfied customers. It is the rating that you have been waiting for."

Finally, the "practical black" ratings are referred to as the regular commercial catalog ratings which have been used for years.

Readers of THE HEATING AND VENTILATING MAGAZINE who recall the article by Samuel R. Lewis, in the April, 1923 issue, discussing cast-iron boiler ratings, will take renewed interest in the findings there recorded, in the light of this latest development in the boiler rating question.

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IN AN effort to promote the true Spirit of Craftsmanship, an ambitious program has been inaugurated by the Philadelphia Building Congress whereby the various groups of workers in the building industry in that section will be given designations better suited to their activities. The group now composed of mechanics, artisans, skilled workers, etc., will be known as Craftsmen. Then there will be Assistant Craftsmen and Junior Craftsmen. Going up the scale, those engaged in any of the crafts, who have shown special skill in developing the artistry or handicraft possibilities in their particular field of work, and have given visible evidences of individuality, will be recognized as Guildsmen.

Finally, architects and engineers, specifically those "who have designed, specified and supervised buildings which have been successfully erected," and have the other requisite qualities, will be known as Master Craftsmen, while builders and sub-contractors "who have satisfactorily either erected buildings or other structures or parts thereof, or installed equipment therein," will be known as Co-Operating Master Craftsmen.

## Heating and Piping Contractors' National Association

# Atlantic City Convention of Heating Contractors Prepares to Defend Its Standard Radiation Formula Against That Proposed by Heating Engineers

AN ISSUE raised through the fact that the work of the standardization committee of the Heating and Piping Contractors' National Association, in the standardization of methods of figuring radiation, is being parallelled by the code committee of the American Society of Heating and Ventilating Engineers, had an airing at the Atlantic City convention of the Heating and Piping Contractors' National Association at the Chalfonte-Haddon Hall, May 26-29. The discussion of this matter proved one of the major themes of the convention.

The importance of the establishment of only one standard, as the heating contractors see it, lies in the fact that eventually they must guarantee to all purchasers of radiation that the radiation figured on the basis of the standards established by the association's engineering standards, is the correct amount to be provided in a given building and that the association will stand back of its members who provide the amont of radiation called for by their standards. It is felt that if more than one standard method is adopted, as far as the courts are concerned, none of these would have the proper standing.

In one of the resolutions adopted by the convention the position taken by the standardization committee was warmly endorsed.

The convention was well attended and the reports presented reflected prosperity in both the association and in the industry.

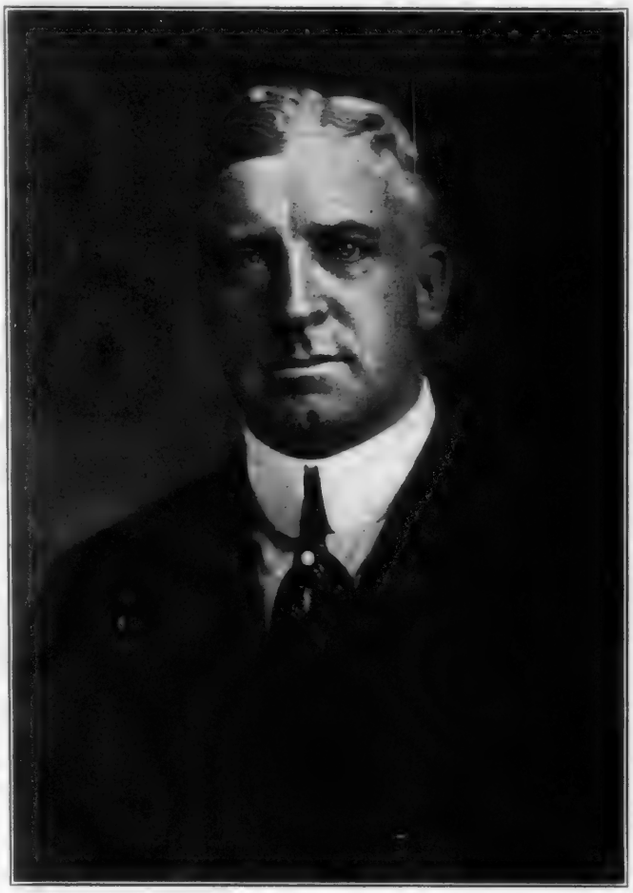
### Opening Session, Tuesday Afternoon

President George M. Getschow opened the convention Tuesday afternoon, in the Vernon Room of Haddon Hall by introducing A. T. Nichols, representing the mayor of Atlantic City. Mr. Nichols welcomed the association in the name of the mayor and cited the fact that it was the association's twelfth visit to the seaside resort.

President Getschow responded and then delivered his annual address, the principal parts of which are given herewith.

### President's Address

President Getschow's address was taken up largely with a thoughtful analysis of business conditions at the present time and what the industry may reasonably look forward to in the immediate future.



**Frank A. Merrill, Boston, Mass.**
*The New President of the Heating and Piping Contractors' National Association.*

"We have no apologies to make for our calling," he declared. "Quite the contrary, we are proud of our profession. Truly we may proclaim ourselves to be promoters of the comfort, health and individual efficiency of our fellow men, for our part lies in making more healthful and pleasant all structures in which humans daily pass their time."

Referring to the general economic and financial condition of the country, President Getschow declared:

"Never has there been a time when elements of uncertainty were lacking in commerce and industry —let us hope there never will be such a time.

"Without the ever-present threat of danger or discomforts as motivating force which drove peoples, now known as civilized, out of their caves, how would the splendid shelters we find about us today have ever been evolved? The perils of health, the dread of cold and the rigors of the elements were primarily responsible for the development of modern heating and sanitation. Without the factor of uncertainty in commerce and industry, the driving power of enterprise and ambition and the zest of achievement would be lacking in our individual and collective lives.

"In considering the concrete question as to how long the present handsome volume of building is to continue, it is necessary , in a general way at least, to appraise the factors which will operate for or against. It is, of course, self-evident that construction work, including our contribution thereto, represents an imperatively important part of the nation's industrial activity at all times, particularly has this been true of the immediate past.

"Seldom has any line of industry been favored at the outset of a year with such strongly supported forecasts of a phenomenal demand as ours at the beginning of 1924. All signs and portents pointed toward a year, perhaps, the greatest in our history, and the prophecy appears to have been justified.

"Since this country is a rapidly growing one, and will continue for decades to be such, notwithstanding the tightening of immigration restrictions all along the line, building will continue to play a paramount role in maintaining business activity on a high plane —at least until the existing housing shortage has been overtaken, and the condition caused by insufficient construction work during and after the war years have been overcome.

"True, there has been some sugges-

tion that the building shortage, due to the dislocation of industry during the war years, has been taken care of to a substantial extent. Figures and statistical information amply available all over the country and indicating the need for homes, particularly in the principal cities of the country, do not confirm any such conclusion or assumption—although it is entirely true that the demand for more space is not as uniformly distributed as formerly.

"Apart from the fact that population is increasing constantly and consistently, what is, perhaps, of greater importance, for the purpose of our discussion, is that per capita wealth is increasing faster than the number of inhabitants.

"The demand for housing of a higher quality, including better heating, more light and modern sanitary surroundings, grows and will continue to grow, with larger means available to the average American householder, and an ever increasing number of persons are being educated to use and accustom themselves to those things that conduce to their physical and intellectual improvement and comfort. Inevitably this will prove the increasingly important and decisive influence in creating that class of work in which the members of this association are primarily interested.

"The high labor and material costs, incident to all building, continue to cause great concern, although a more reasonable tendency in the cost of materials appears to be manifesting itself. No opportunity should be overlooked to convince all interested in the continuance of the current building volume that every effort made to keep these costs within bounds, will work for their own best interests ultimately, and, indeed, in most parts of the country there is a realization on the part of labor factors of the truth that there is always a breaking point.

"As a compensating concurrent of high wages, it must be remembered, however, that high purchasing power widely distributed must be counterbalanced by high wages and salaries. Otherwise, we cannot long hope to enjoy the benefits of an ascending scale.

"There is no time when the cost of building does not act as a limiting factor, and it is axiomatic that they should be maintained always as low as possible, consistent with the quality of service rendered. Everything which adds unnecessary cost is doing its part to reduce the volume of construction work. The number of buildings reaching the stage of completion for the installation of heating during the first half of 1924, promises to be the largest on record, and it appears certain that the country is in for a continued and protracted period of substantial activity."

President Getschow discussed, in turn, the economic situation as affected by the presidential campaign, the Washington investigations and the agricultural depression. He felt that there was little likelihood of inflation, as the lessons of the after-war years have not been forgotten.

"At no other time," he declared, "have the leading business men been better informed as to the action and reaction of economic theory, and today there is watchfulness, a degree of conservatism everywhere in evidence that bespeaks safety."

### How the Convention Backed Up the Standardization Committee in Its Compilation of Rules for Figuring Radiation.

Whereas, the Heating and Piping Contractors' National Association is deeply interested in the standardization of methods of figuring radiation and other items entering into the design and installation of heating systems, and

Whereas, its Committee on Standardization has, for a number of years, been working on the development and standardization of methods for the calculation and design of heating systems, and

Whereas, the committee has brought its work to a point of practical application, and

Whereas, from its study of this subject it has come in contact with work on similar but, in its opinion, not as highly-developed practical lines, and

Whereas, it feels that all those interested in the development of this art should work in accord and on the same basis, so that the methods adopted shall have their full force before the courts and the public, therefore be it

Resolved, that the Heating and Piping Contractors' National Association invite into conference the American Society of Heating and Ventilating Engineers, the National District Heating Association, the National Boiler and Radiator Manufacturers' Association and the American Society of Mechanical Engineers, with the idea of having the representatives selected by them act as sponsors, in conjunction with this association, for developing and adopting of uniform rules and methods for the calculation and design of heating systems.

"Our business, our prosperity," he concluded, "must and will continue to grow in the same measure that we endeavor to serve others as we are being served in a thousand ways by them. . . . Working harmoniously throughout the years to come, it is my heartfelt wish that each and all of our members will continue to enjoy the great measure of material well-being and prosperity that is theirs at present and that each and every one will be given, in even greater degree, the good things of life and the blessings which come alone from work well done."

#### RESULTS OF SPRING LABOR SURVEY

A notable work done by the association was reported by Secretary Henry B. Gombers in the form of a table dealing with wages and conditions in the steamfitting trade in the United States as of May 15, 1924. The reports from 65 cities are presented in the compilation. The data included statistics on agreements, hours of work, and overtime pay, in addition to wages for steamfitters and steamfitters' helpers.

#### SECRETARY'S REPORT

Secretary Henry B. Gombers, in his report, referred particularly to the increasing activities of the society's headquarters, mentioning the data on rates of wages and conditions of labor which are kept on file, and the watch kept on legislation.

Referring to the matter of heating guarantees, Mr. Gombers said that in a recent survey made by the association in cities of 50,000 population or over to ascertain the current practice as to guarantees, it was found that there is a real need for a definite solution of this problem.

Reporting for the Membership Committee, Herbert A. Snow, chairman, told of the extensive plans formulated and carried out during the past year, which has brought an increase of 42 new member firms during the year. He recommended that the work be continued by the next Membership Committee as soon as appointed, so that there would be no lag in the drive.

Before adjourning President Getschow announced the convention committee appointments, the chairman being: Auditing, J. T. Dyas, New York; credential, F. S. Spencer, Minneapolis; resolutions, J. P. Baldwin, Chicago; association relationship, Horace W. Jones, Rochester, N. Y.; association improvement, Joseph G. Hayes, Indianapolis, Ind.; nominating, Harry G. Black, Philadelphia.

### Morning Session, May 28

The Wednesday morning session was opened with the presentation of the report of the Board of Directors, by W. H. Driscoll, chairman.

### Report of Board of Directors

Value of membership in the association, the report stated, would be very forcibly brought home to us if its existence were suddenly terminated. As a moral force in stabilizing the industry in which we are engaged, its effect is more far-reaching than we appreciate and its failure would shortly result in a chaotic condition of affairs in our industry that would be very disastrous to us, individually and collectively.

Radical influences in labor unions, went on the report, that are ever creat-

ing discontent in the ranks of organized labor, would be far more effective than they are if labor did not have a greater respect for the influence of a well-organized employers' association than it has for the influence of any individual.

Trade conditions, generally, are not only improved but the evil practices that would otherwise exist in connection with the marketing of heating products are practically eliminated by the very existence of such an association.

The report then went on to tell of the movements which had been started during the year to encourage greater interest, closer co-operation and better understanding on the part of the members.

One plan which is shortly to be carried out is the publication of leaflets at frequent intervals, devoted to matters of interest. More opportunity will also be given at conventions to bring up timely topics and to encourage discussion of them.

The association's *Official Bulletin* has been changed considerably in its make-up and contents with a view of livening it up and widen the scope of its usefulness.

Details were given in the report of the association's connection with the actions of the National Board of Jurisdictional Awards which led up to the final decision of the board to place under the jurisdiction of steam fitters, rather than hoisting engineers, the matter of furnishing low-pressure heat during the completion of the heating system while a building is under construction.

The financial condition of the association was reported as very sound. The board contributed $750 to the National Trade Extension Bureau during the year, and $250 to the A. S. H. & V. E. Research Laboratory.

The report paid a warm tribute to the late Elias D. Smith, stating:

We feel, however, that we are not making undue discrimination in matters of this kind when we record herein the fact that Almighty God has called to his eternal reward that kindly old soul and faithful member of our organization since its earliest days—Elias D. Smith. He was our president more than a quarter of a century ago and for years, as dean of the profession, has been president of "The Old Guard." For the first time in many years he will be absent from our sessions and we shall miss him; but, in the sadness of our hearts, we shall be comforted by the fact that he has lived his allotted span of life in a most worthy manner and that, in passing, he has merely gone forth to receive the reward which is his.

### TALK ON OIL BURNING

One of the high spots of this session, and of the entire convention, was a talk on oil burning, by A. H. Ballard, of the Ballard Oil Equipment Company, of New York.

Mr. Ballard's remarks were devoted particularly to the domestic fuel-oil field. As the output of fuel-oil, he said, depends upon the output of the refined products, he felt there was no cause to think that the supply of fuel-oil would not be permanent, especially on the seaboard.

As to comparative costs, he gave the figure of 156 gal. of fuel-oil as equalling one ton of coal. This, however, means little unless operating conditions are known. He instanced one case where 138 gal. were giving the equivalent heat from a ton of coal, while in the Vanderbilt Hotel, New York, the figure was found to be 132 gal.

Oil, he said, is less injurious to boilers, but the equipment must be properly installed. It is easy to have a large waste of oil.

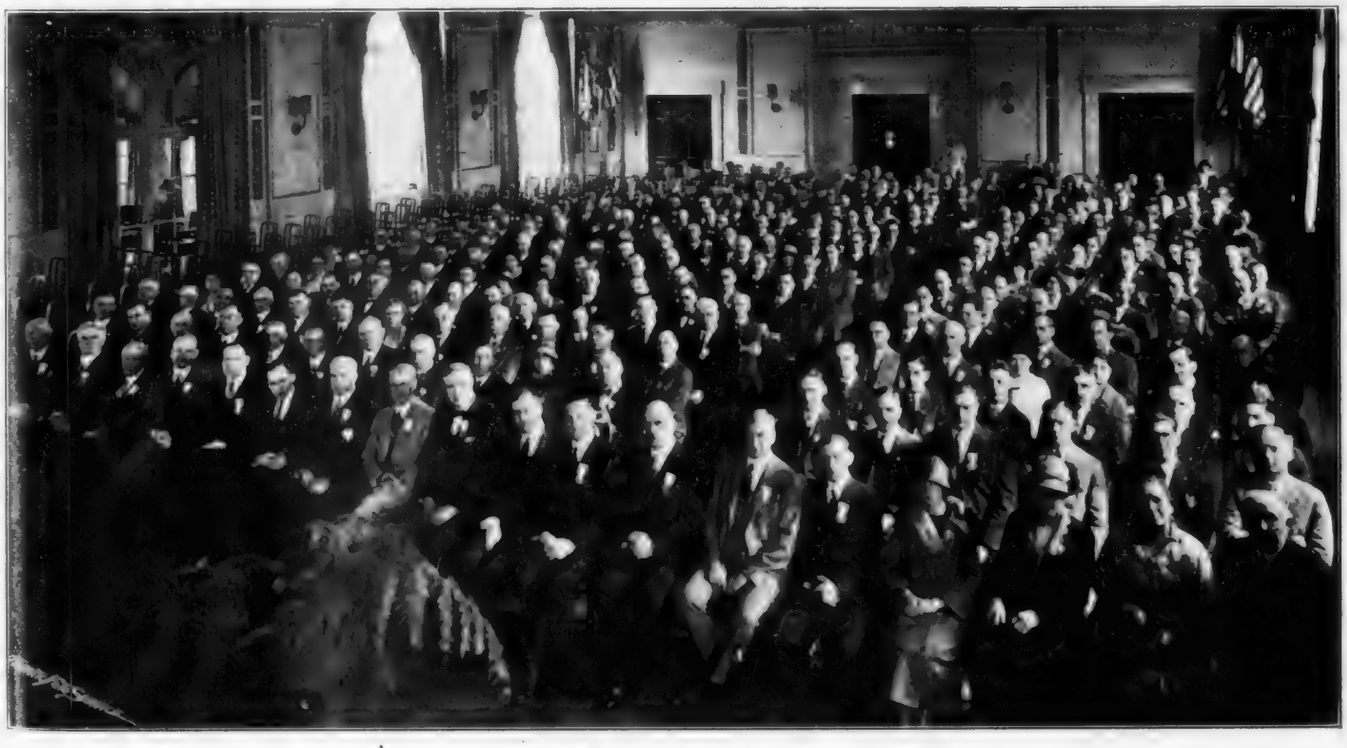
Mr. Ballard admitted very frankly that the low-pressure heating field, using fuel-oil at 14° to 16° Baumé was quite a problem. The price of a low-pressure installation is such that the plant cannot be amortized to a point where it will warrant the installation on an economy basis.

All the new buildings, however, he said, are being equipped with oil-burning outfits and in New York alone 3,000,000 bbls. of oil are being burned a year, the equivalent of 750,000 tons of coal.

There is nothing in the story, declared Mr. Ballard, that it is an economic crime to burn fuel-oil. There is no better use that can be made of it. He came out strongly against gravity feed burners, declaring that the oil must be atomized to be properly burned. In this connection he advocated steam atomization as much preferable to mechanical vaporization and declared he was willing to stand on that statement at the risk of being considered behind the times.

He expressed his firm belief that every home, in the future, will have a fuel-oil installation. Many of the present devices, however, he felt were going to work a hardship on the public.

As many as 98% of the fuel-oil domestic burners are designed to burn furnace oil. He felt this situation was unfortunate as we cannot afford



**Convention Photograph of the Heating and Piping Contractors' National Association, Haddon Hall, Atlantic City, May 26-29, 1924.**

to burn furnace oil over 50% of the time. We must have means, he felt, to burn fuel-oil of from 20° to 30° Baumé gravity.

Speaking of the advantages of fuel-oil, he dwelt on the even temperatures secured, and declared that people who once experienced its benefits would not go back to coal-burning apparatus.

He warned his hearers, however, that they must be careful to prevent any tampering with the apparatus itself and declared that every manufacturer must be prepared to give service whenever required. He listed the essentials of domestic oil burning as (1) Proper equipment, (2) the use of fuel-oil, (3) service and service stations, and (4) thermostatic control.

HOW THE BUILDING INDUSTRY SHOULD FUNCTION

A proposal which involved nothing less than the repeal of the Sherman anti-trust law and the revival of price-fixing agreements, somewhat along the lines of the cartels in Germany, was advanced in an address on the functioning of the building industry, by Sullivan W. Jones, New York State architect, Albany, N. Y.

Mr. Jones likened the functioning of the entire building industry to that of a large corporation and declared that there was a lack of control in the building industry which would not be permitted in a business concern.

He went at length into the parts played by the owner, architect, general contractor, sub-contractor, laborer and, finally, the manufacturer, and declared that the lack of coordination all down the line was producing an enormous waste, resulting in the present-day excessive construction costs.

He felt that the manufacturers, particularly, were letting production force the market, rather than the market controlling production. The additional sales efforts, he said, which are being used, do not increase consumption but result merely in substitution.

To show some of the wastes in the building industry he cited the case of the Chicago Tribune Building. The cost of the competition for this building on the part of the architects came to $200,000 which of course, he said, is passed on to the consumer.

Mr. Jones not only advocated combinations in restraint of trade, but urged a general organization of industry with the proviso, however, that the consumer or owner, should be included in the organization. He felt this was the only way to maintain standards of quality in materials and service.

"We must have basic standardization," he said, "and a balance between supply and demand. There must be an allocation of products."

Competition, he submitted, is an unsound doctrine, and he estimated that 25% of the cost of building materials goes for selling. "We are paying 100% more than necessary for building materials," he declared.

He urged as the first step, standardization and, as the next step, price fixing and the fixing of profits. He believed we are nearer that sort of thing than we think, and he cited the transportation act and the agricultural laws as an evidence of the trend, adding that the tariff was a classical price-fixing proposition.

REPORT OF STANDARDIZATION COMMITTEE

The session concluded with the report of the Committee on Standardization, presented by W. L. Fleisher, chairman.

### The New Officers

President, Frank A. Merrill, The Merrill Co., Boston, Mass.

Vice-President, William H. Driscoll, Thompson-Starrett Co., Long Island City, New York.

Treasurer, Horace W. Jones, Howe & Bassett, Rochester, N. Y.

Secretary, Henry B. Gombers, New York.

Board of Directors: The president, vice-president and treasurer and: Horace W. Jones, Howe & Bassett, Rochester, N. Y.

Harry M. Hart, L. H. Prentice Co., Chicago.

William M. Anderson, Philadelphia, Pa.

Edwin P. Ambler, Jr., Edwin P. Ambler, St. Louis, Mo.

R. Templeton Smith, McGinness-Smith Co., Pittsburgh, Pa.

M. L. Crowell, Crowell & Smith Co., Cleveland, O.

### Report of Standardization Committee

After stating that the "engineering standard" sheets brought out last year had been widely adopted, the report told of how the Chicago Association checked its present standards by the new standards, while the Cleveland Association drew up a schedule of values based upon the Standardization Committee's work, and the Boston Association had asked for a simplified chart based on the accepted data. Other associations, it was added, are using to their best ability or have expressed great interest in the work done.

The report then expressed the concern of the committee over the fact that the work it has been doing in the standardization of methods of figuring radiation has been paralleled by the Code Committee of the American Society of Heating and Ventilating Engineers.

"By laying all of our data before them," stated the report, "we have attempted in every way possible to facilitate their work and we have been urging from the time that we knew that they had started this work, a close co-operation between the two associations, so that one set of rules or methods could be developed by the two Associations in order that the final results should carry greater weight."

A plea was made that the force of the Heating and Piping Contractors' National Association, through its members who are also members of the other association, should be brought to bear so that no code of the A. S. H. & V. E. conflicting or not in accord with the Heating and Piping Contractors' "Engineering Standards" should be finally made an approved code of the heating engineers' society, without first having the approval and sponsorship of the heating and piping contractors' association.

These views, it was stated, were presented at the annual meeting of the A. S. H. & V. E. and it was agreed that the methods as worked out in "Engineering Standards" were in rather better form for actual, practical use than the code which the heating engineers' society up to that time had developed.

LEGAL STATUS OF A CODE

The committee, stated the report, had in mind two purposes in carrying forward the work that they did:

First: Ease of figuring and properly figuring the amount of radiation required to heat buildings.

Second: To obtain a uniform method of figuring radiation, which would have the approval of all those to whom the courts might look for technical information on the proper methods and the proper quantities for figuring radiation.

"If we," continued the report, "through our Committee on Standardization, develop one method of figuring radiation, the American Society of Heating and Ventilating Engineers another, the National District Heating Association another, and the manufacturers another, as far as the courts are concerned, none of these would have the proper standing. There is a feeling that eventually we must guarantee to all purchasers of radiation that the radiation figured on the basis of the standards established by the Heating and Piping Contractors National Association, through its Engineering Standards, is the correct amount of radiation to be provided in a building and that the association will stand back of its members who provide the amount of radiation called for by their standards.

Supplementing the report, charts were presented for sixteen cities, based on the methods used by the Standardization Committee, giving in tabular form the square feet of radiation required for wall, glass and infiltration for various types and classes of materials and windows. These have been checked by actual experience in Philadelphia, Chicago. Boston and New York.

ROUGHING-IN DIMENSIONS FOR RETURN-LINE VALVES

"The standard roughing-in dimensions for return-line valves" continued the report, "have not had the backing that such a simplification deserved—in that we cannot find that the members are specifying that return-line valves shall be in accordance with the stand-

*Continued on page 71*

# New Regulations For the Installation of Blower and Exhaust Systems

Under the separate headings of "Heating and Ventilating Systems," "Systems for Removable of Flammable Vapors" and "Stock and Refuse Conveying Systems," the National Fire Protection Association has just adopted revised regulations here given for the installation of blower and exhaust systems. Final action was taken at the annual meeting of the association, May 13-15.

In the general introduction it is stated that "these requirements are not intended to cover portable exhaust (vacuum) systems. The underlying principles, however, apply to them."

Attention is also called to the fact that in the regulations for special industries or operations there will be found special requirements not incorporated in these regulations, or modifications of certain of these regulations. Among the processes to which this paragraph applies are spray booth, and japanning and enameling; pulverized fuel systems; prevention of dust explosions in terminal grain elevators and in flour and feed mills; and dry-cleaning plants.

*Fans.*—Fans must be so located and installed as to be readily accessible for repairing, cleaning, inspecting and lubricating. They may be either direct-connected or belt driven. Noncombustible materials must be used in the foundation and supports. The location and installation of the fans is subject to the inspection department having jurisdiction.

Housings must be of proper construction and runners must be of sufficient size and capacity so as to eliminate the necessity of speeding.

Exposed openings into the housings must be protected with metal screens or grating.

*Ducts.*—Ducts may constitute a part of the structure or may be independent thereof. Fire-resistive or noncombustible materials must be used in their construction. The entire system of ducts must be self-contained; no rooms, hallways, attics, hollow or concealed space, voids or other portion of the building may be used as any part of the system, unless it is an integral part thereof used for no other purpose and properly protected against fire. All ducts must be tight throughout and have no openings except those necessary to perform the required functions of the system.

When ducts or the outlets from or inlets to same pass through fire walls, they must be provided with approved automatic fire doors or shutters, on both sides of the wall through which they pass. (Figs. 1, 2 and 3). The only exceptions to this are where doors or shutters are normally closed, and open only in the direction of the pressure, i. e., self-closing doors or shutters, acting as dampers, may be advisable or preferable, and these may be substituted by permission. These dampers however are not permitted in fire-wall openings, but are intended and permitted as guards against back pressure.

Approved heat-actuated devices must be located where most readily affected by a rise in temperature inside of the ducts and in addition thereto, on the outside, if the conditions permit or warrant. Such devices must offer no obstruction to the passage of materials.

Joints between ducts and floors, walls or partitions, must be made tight by means of non-combustible material.

The systems must have emergency control to shut them down in case of fire. This may be done manually, or automatically, by means of devices utilizing approved thermostats, automatic sprinklers, or other heat-actuated devices. Automatic control systems are recommended. It is recommended that fans be driven independently of other machinery. Such installations must have the approval of the inspection department.

### HEATING AND VENTILATING SYSTEMS

A note states that as these systems are frequently used for cooling purposes, as well as for heating and ventilating, and as these functions are interchangeable, the requirements are applicable to cooling systems, as well as to heating and ventilating systems. When systems are used exclusively for cooling purposes, these regulations apply insofar as passages through floors, walls and partitions are concerned and the required protection of such passages. In addition to the specific requirements for this class, the general requirements, as already summarized, apply.

Intake of air must be from the outside, except in recirculating systems, and shall be taken only from areas containing no combustible materials. They must be provided with suitable automatic shutters or doors.

Outlets on supply and exhaust ducts must be provided with registers, regis-

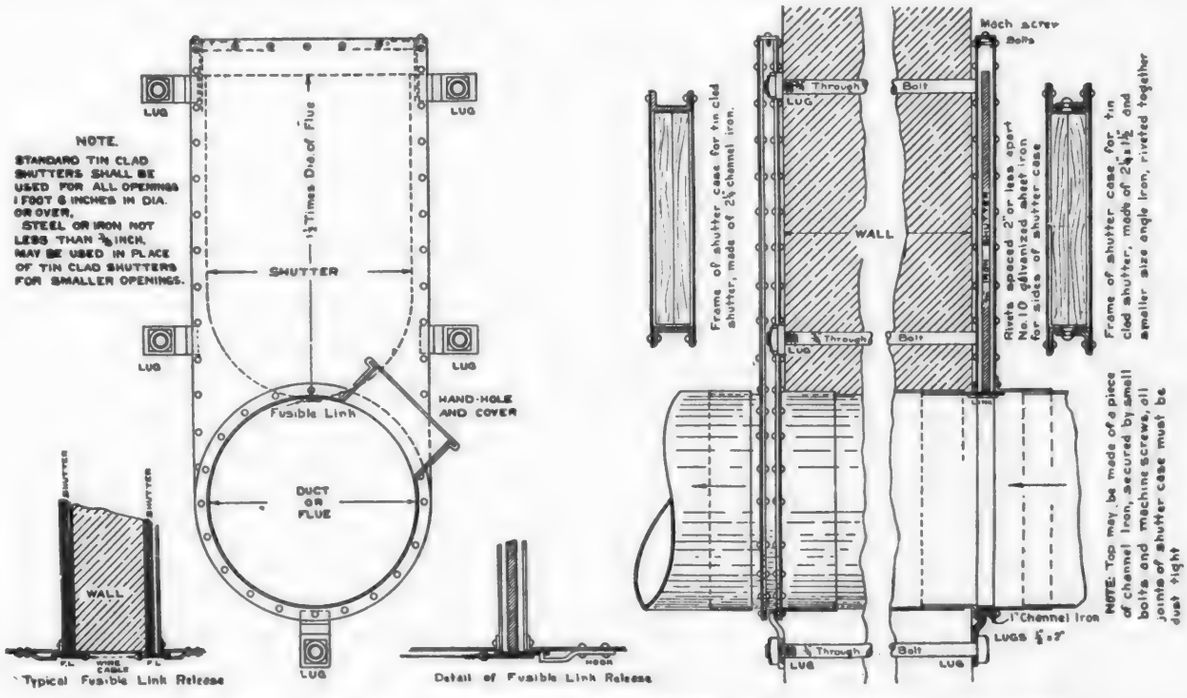

NOTE.
STANDARD TIN CLAD SHUTTERS SHALL BE USED FOR ALL OPENINGS 1 FOOT 6 INCHES IN DIA. OR OVER. STEEL OR IRON NOT LESS THAN 3/16 INCH MAY BE USED IN PLACE OF TIN CLAD SHUTTERS FOR SMALLER OPENINGS.
LUG
1½ Times Dia. of Flue
SHUTTER
Fusible Link
HAND-HOLE AND COVER
DUCT OR FLUE
WALL
Typical Fusible Link Release
Detail of Fusible Link Release
Mach. screw Bolts
Through Bolt
Frame of shutter case for tin clad shutter, made of 2½ channel iron.
Rivets spaced 2" or less apart No.10 galvanized sheet iron for sides of shutter case
Frame of shutter case for tin clad shutter, made of 2½x1½ and smaller size angle iron, riveted together
1" Channel Iron
Lugs ½ x 3"
NOTE: Top may be made of a piece of channel iron, secured by small bolts and machine screws, all joints of shutter case must be dust tight

**Fig. 1. Suggested Type of Vertical Duct-Shutter for Openings in Fire Walls**

ter faces or substantial screens of wire or expanded metal of not more than 1 in. mesh. In no case can the clearance between metal ducts and combustible material be less than 1 in. Any combustible material within 6 in. of such ducts must be protected by incombustible material.

All ducts passing through and in contact with unprotected combustible floors shall be made of approved fire-resistive material, not less than 4-in. fire brick, 6-in. hollow tile, 2-in. Portland cement plastered partitions with substantial steel reinforcement, or their equivalent.

When vertical ducts within the same area serve more than one floor, automatic dampers must be provided on all outlet openings directly at all connections at branch ducts from such vertical ducts. Bearings of such dampers must be of non-corrodible material. (Figs. 4 and 5).

When branch ducts from vertical ducts pass through fire-walls, the outlets must be suitably protected. Openings through floors, or through fire-walls or fire partitions for the circulation of air, unless provided with approved protection, are not permitted.

*Ventilation of Cooking Appliances.*—Ventilating ducts for carrying off grease-laden vapors from hoods over cooking appliances, especially in kitchens of large restaurants and hotels, must be made of not less than No. 18 gauge steel, with tight-riveted joints; their installation must be approved. The ducts must be separated 9 in. from all combustible material, or else this material must be protected in an approved manner.

The ventilating ducts must constitute an independent system, in no manner connected with other house-ventilating systems. They must not be connected to stacks, chimneys or flues used for other purposes. Wherever practicable, a live steam jet should be provided in the duct.

Hoods over cooking or similar appliances must be constructed of non-combustible materials throughout, with tight sides and tops, and have at least 18 in. clearance from all unprotected combustible materials. The connections between the hoods and the ventilating flues must be at the highest points of the hoods and of a size not less than that of the ventilating flues.

*Next month's issue will contain the requirements for systems for the removal of flammable vapors, and for stock and refuse-conveying systems.*

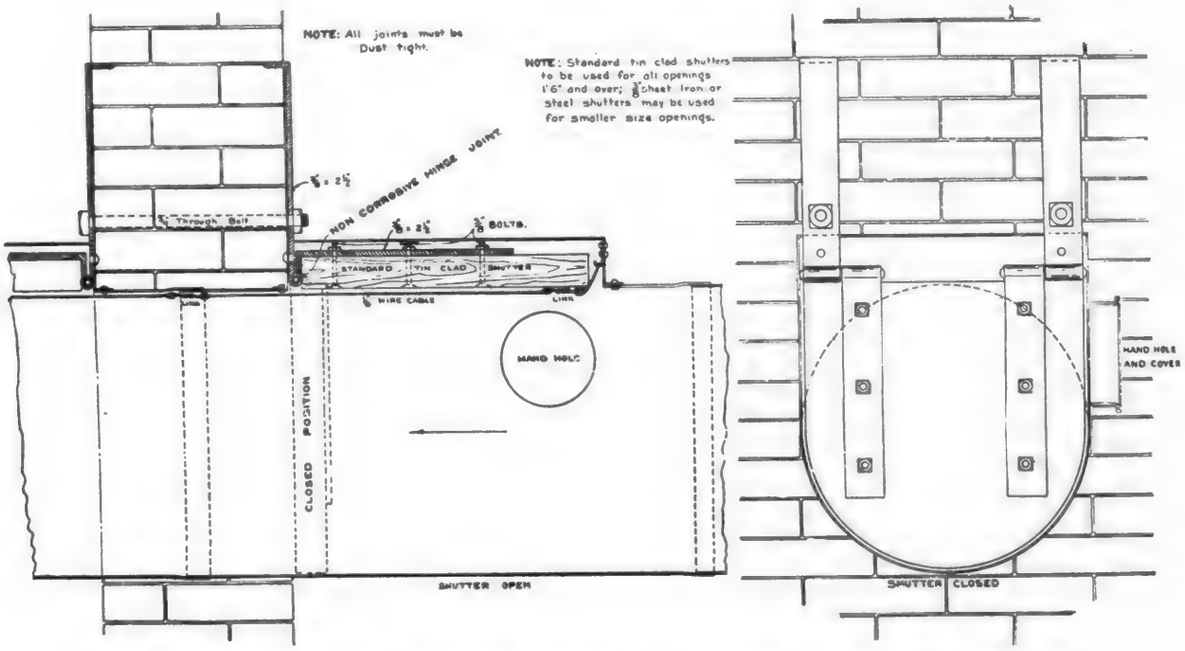

NOTE: All joints must be Dust tight.
NOTE: Standard tin clad shutters to be used for all openings 1'6" and over; Sheet Iron or steel shutters may be used for smaller size openings.
NON CORROSIVE HINGE JOINT
TRIGGER BAR
STANDARD TIN CLAD SHUTTER
WIRE CABLE
LINK
HAND HOLE
CLOSED POSITION
SHUTTER OPEN
HAND HOLE AND COVER
SHUTTER CLOSED

**Fig. 2. Suggested Type of Automatic Hinged Duct Shutter for Openings in Fire Walls**

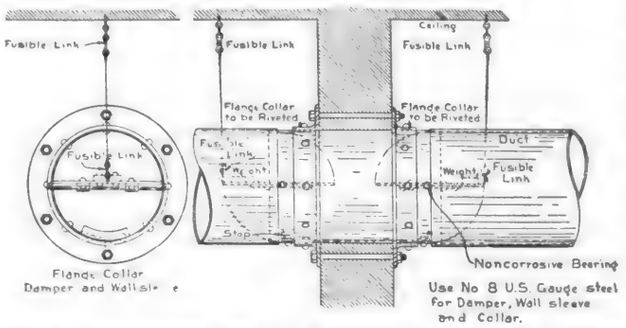



**Fig. 3. Suggested Type of Automatic Dampers for Duct Openings Not Over 12-in. in Diameter in Fire Walls**

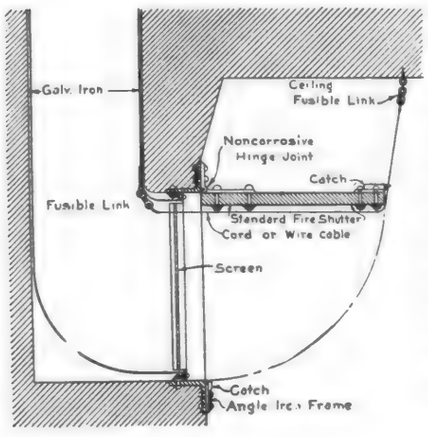



**Fig. 4. Suggested Type of Automatic Shutter at Outlet Openings**

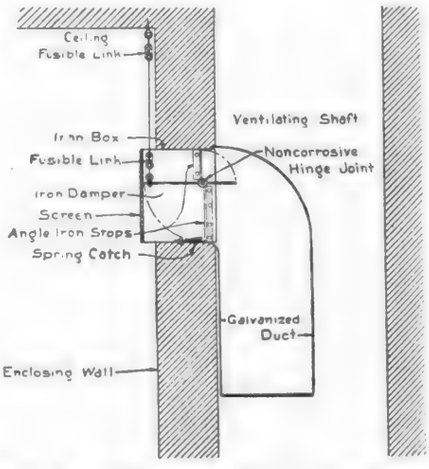



**Fig. 5. Suggested Type of Automatic Damper at Outlet Openings or at Opening to Branch Ducts**

# Correspondence

## Notes on House Humidifying Problems

EDITOR HEATING AND VENTILATING MAGAZINE:

Mr. P. H. Bryce's article in the March number of your magazine, entitled "Studies in House Humidification," brings up some questions regarding humidification.

The bad influences of overheating homes that are so dry in winter time was mentioned. A point is made of the comfortable condition of 15° air for ski-ing, tobogganning, and snowshoeing. Assuming that this 15° air has a relative humidity of 70% it contains considerably less than a grain of moisture, so that when heated to 98° in the nose, throat, and lungs, it has just as much moisture absorbing capacity at this temperature as though it were heated by a furnace to this temperature.

Furthermore, the exhaled breath is practically saturated, so that a great many grains of moisture in a cubic foot are added to the air inhaled by the nose, throat, and lungs, and no more would be added if the same air had been first heated to 70° and then inhaled. It is frequently overlooked that the exhaled air is practically saturated, and therefore has a moistening effect on the lining of the nose and throat during the exhaling process.

EVIDENCE OF AIR INLEAKAGE

The inference is drawn from the article that the home that was fitted with the humidifying apparatus needed a supply of outdoor air. It is to be further inferred that the air was recirculated in the home, because the article states there was no regular inlet supply of outer fresh air. If the air were recirculated, and the building was exceptionally tight, it is to be expected that the humidity would eventually increase probably 70% or more, yet the humidity was found to be 28% on a zero morning.

This can only mean one thing; that there was a tremendous leakage of outside air into the home, and because it contained so little moisture it resulted in the air in the home having a low relative humidity at 70°. This leakage is common knowledge, and is one of the items that a heating engineer must consider in calculating the size and capacity of a heating plan for a building. Air leaks in around window casings, through the walls, around doors, and so forth; consequently, the home in question was undoubtedly supplied with outside air, and likely in larger quantities in proportion to the space enclosed than schoolrooms or auditoriums.

THE COST OF HUMIDIFYING

A further inference is made that the humidifying apparatus would reduce the cost of heating, for by reducing the temperature from 75° to 66° when the air was humidified, the statement is made that economy in fuel was secured, but what about the cost of electricity for warming the outside air and adding the moisture to it? Reducing the temperature indoors from 75° to 66° would, in zero weather, reduce the heat required about 12%, but to heat 50,000 cu. ft. of air per hour from 0° to 66° would require about 68,000 B. T. U., and 3 gal. of water evaporated per hour would require about 26,000 B. T. U., making a total of 94,000 B. T. U. required for the humidifier. If 12,000 B. T. U. were secured from 1 lb. of fuel-oil, this would mean that an equivalent of 7½ lbs. of oil would burn per hour for heating and humidifying this outside air, or this number of B. T. U. referred to in watts would be more than 27,000, or more than 27 K. W. It is to be presumed that the electric current for heating the water in the humidifier would cost something, and supposing it was only 2 cents per K. W. it would cost 54 cents per hour to operate. Therefore, did the humidification result in economy in fuel?

F. R. E.

Boston, Mass.

## Operating Costs of Institutional Heating Plants

EDITOR HEATING AND VENTILATING MAGAZINE:

In the case where we have 40,000 sq. ft. of steam radiation, now operate a power plant in connection with same, making electrical energy for institution work. We carry 125 lbs. steam pressure, use a reducing valve, and carry about 4 to 7 lbs. on the low pressure heating system. Using vacuum pumps, steam driven for returns.

The central station people show us where they can sell electrical energy to us for about 2c per K.W. hour, and we figure that we make it for 4½c per K.W. hour. Our electrical load runs 500,000 K.W. hours per year. We steam heat full capacity for 24 weeks per year.

The question is, will we save any fuel if we reduce the steam pressure in the boilers to, say, 25 lbs., and reduce to 5 lbs. for the heating system. Our fuel account runs now about 25,000 barrels of oil per annum.

Austin, Texas J. P. G.

REPLY

The electric load at this institution is small, compared with the heating load, as the heating load will run about 400 B.H.P. in the winter time and the electric load will require only approximately 50 B.H.P. for the peak load. The boilers are designed for 125 lbs. steam pressure and will probably not operate any more efficiently at 25 lbs.

One of the great items entering into the cost of electric current is the interest on the investment, as the plant would have little scrap value and is already installed. This item, however, can be ignored.

The amount of labor, it is believed, cannot be reduced whether there is an electric plant or not, except that there might be a reduction of labor in the summer time if the boilers could be shut down altogether. This is not stated in the question.

It would appear, therefore, that electrical energy can be generated for much less than 2 cents per kilowatt-hour, when the item of interest on the investment and labor charges are ignored.

G. B. N.

## The Early Days of Heating and Ventilation

EDITOR HEATING AND VENTILATING MAGAZINE:

You are to be congratulated for publishing the interesting biographies of "Who's Who in Heating and Ventilation." The historical side of the heating and ventilation science mentioned in these biographies is of particular interest. Your April, 1924, issue states that, so far as known, there were, in 1887, only three public buildings in America heated and ventilated by the forced circulation of warm air produced by blowers. Prior to that year there were many more than three public buildings equipped with fans for heating and ventilation by a forced circulation of warm air. In 1884–1885 Mills had equipped the Buffalo State Insane Asylum, and in 1883-1884 School No. 13 Buffalo, and the Hampden County Jail and House of Correction. Also School No. 10 Delaware Avenue, Buffalo, about 1886.

Walworth had installed fans even earlier for ventilation. So had Robert Briggs. Sturtevant had developed his hot blast apparatus, which he patented in 1870, and had applied it for drying lumber and various materials. He had applied his fans and heaters for heating factories and public buildings. As far back as 1866 he built two fans for the Capitol at Washington. They were the largest fans he had then built.

In 1878 the Committee to Report on the Ventilation System in the House of Representatives stated "The present system of heating and ventilation of the House of Representatives is based upon correct principles, and should not be changed for any of the so-called systems of natural, or downward, or lateral ventilation."

Sturtevant had for many years applied his fans and heaters for factory and public building heating and ventilation, and had done so much work in that line that he deemed it worth while to publish a catalog about it. It was published in 1888 under the title "Ventilation and Heating, Principles and Applications."

The publication contains drawings of many shops and factories heated by the forced circulation of warm air. It also describes, in detail, the forced blast system, designed by Prof. Woodbridge for one of the buildings of the Massachusetts Institute of Technology; also that of the Capitol; and several pages are devoted to the arrangement of the ventilation scheme of the Metropolitan Opera House, which was in use during the winter of 1883–1884. This installation was a wonder for its day. The details of installation and record of tests were quoted from the *Sanitary Engineer.*

Other theatres ventilated and heated, mentioned in Sturtevant's catalog, were the Madison Square Garden, Wallack's Theatre, and the Casino in New York, the Boston Museum, "and many other American halls and theatres." Government buildings included the State House and City Hall, Boston; the House of Parliament at Ottawa, Canada; and the Indiana State Capitol. Hospitals included the Northern Hospital for the Insane at Elgin, Ill.; Willard Asylum for the Insane at Willard, New York; and Murdock's Free Hospital at Boston.

Mention is made in your article that the relative amounts of condensation taking place in radiators used with blowers was not then known. In 1878 Mills had tested Gold's pin radiator with various air volumes flowing across it. Mills, second volume of "Heat" contains a chart and tables of tests which show the heat units transmitted for various air volumes passed. The difference in heat units given off, under varying conditions of air flow, seems to have been clearly established. Sturtevant's catalog of 1888 calls attention to lesser amount of heating surface required in his blast apparatus. He arrives at a figure of 0.29 lbs. of steam condensed per hour per square foot of open pipe radiator at an average temperature of 60° F. surrounding it, and steam at 216° F., but further states that careful experiments with Sturtevant heaters had shown a condensation of 2-2½ lbs. per square foot of heating surface per hour. This would indicate that the relative amounts of condensation in direct and indirect, and blast coils were quite well established.

Hyde Park, Boston, Mass.

F. R. Ellis,
Manufacturing Air Conditioning Department, B. F. Sturtevant Company.

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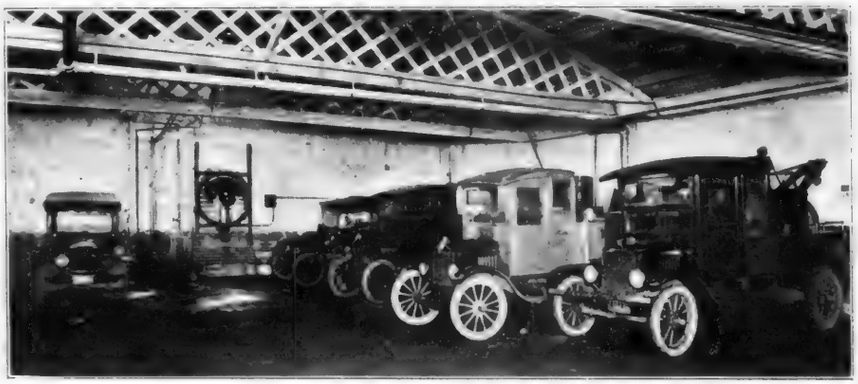
Among the papers presented at the meeting of the National Association of Public School Officials, in Indianapolis, Ind., May 12-16, was one by J. M. Robb, of the Herman W. Nelson Corporation, Moline, Ill., on "Principles of Ventilation as Applied to School Buildings Through the Univent System." Another interesting paper, by R. M. Milligan, commissioner of school buildings, St. Louis, Mo., was on "The Proper Method of Estimating Building Costs and Capacities."



Typical Exhaust Fan Installation in Garage to Remove Garage Gases

## Warning on Garage Gases

In a "Warning" card, which is being sent out in great numbers by the National Life Insurance Company, of Montpelier, Vt., the need of ventilation is brought to the attention of people working in garages. "Thousands of policyholders," states the warning, "keep their automobile in small private garages. We caution all who do this never to run their engines with the garage doors closed. Many persons, including policyholders, have been killed through disobeying this rule.

"The reason for this caution is that all gasoline engines, whether automotive or stationary, generate carbon monoxide gas as a product of combustion.

"This gas is an insidious and fatal poison. Inhaling it in comparatively small quantities (15 parts in 10,000 of atmosphere) causes death. Even employees of public garages and traffic policemen are often affected by it, the first symptom being headache. It is insidious, because the bodily senses of sight, smell, taste and touch are powerless to warn of its presence. The gas is invisible, odorless, tasteless and non-irritant.

"The only way to be safe from the danger, when you are working about your car with the engine running, is to follow this rule: Always work in the open air."

The warning ends up with this note:

"The danger of poisoning from carbon monoxide gas is present also wherever ordinary illuminating gas is used, whether as fuel in cooking stoves, water heaters and room heaters, or as an illuminant, if it should escape unburned. Wherever gas is burned—Continuous and Abundant Ventilation Should Be Provided."

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## New Officers of Kansas City Chapter

New officers of the Kansas City Chapter, elected at the May meeting, held May 5 at the Kansas City Art Institute, are:

President, W. N. McIntyre; vice-president, F. F. Dodds; secretary, P. M. Hays; treasurer, R. B. Johnson. Board of governors: Nate W. Downes, J. B. Fehlig, and E. K. Campbell. Twelve new members were elected, including J. A. Holmberg, Lindsborg, Kansas; K. H. Gedney, Hastings, Kan., and A. R. Barnes, E. D. Hornbrook, E. C. Harbordt, G. H. Gorton, Dawson Campbell, W. F. Cox, Amdi Worm, Walter P. Joyce, R. G. Stewart, and E. H. Graham, all of Kansas City.

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ASIA ENGINEERING CORPORATION, Shanghai, China, of which H. L. Alt, formerly of New York, is consulting engineer, has issued a 62-page booklet covering the large volume of work the firm had completed and had in progress at the close of 1923. The firm, which is headed by P. A. Sargeant as president and general manager, was organized under the name of the Asia Engineering & Contracting Co., in 1919. It is engaged as engineers and contractors for all kinds of heating and sanitary work, ventilation, power plants and piping.

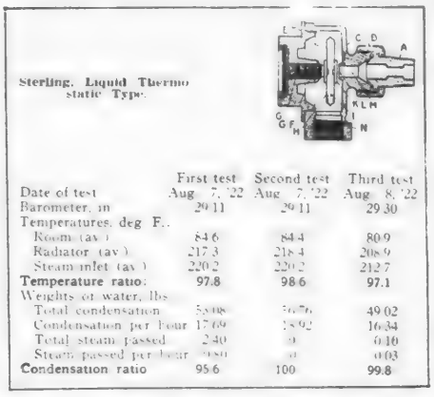
Ilg Exhaust Fan Located Near Garage Floor Line

# Operating Characteristics of Radiator Traps

## What the Heating Industry Should Expect of These Devices in the Way of Performance—A Symposium Based Upon the Recent Tests Conducted by the National Association of Building Owners and Managers

(*Continued from April issue*)

**N.A.B.O.M. Test Results of Sterling Trap, Liquid Thermostatic Type**




| | First test | Second test | Third test |
|---|---|---|---|
| Date of test | Aug. 7, '22 | Aug. 7, '22 | Aug. 8, '22 |
| Barometer, in | 29.11 | 29.11 | 29.30 |
| Temperatures, deg. F.. | | | |
| Room (av.) | 84.6 | 84.4 | 80.9 |
| Radiator (av.) | 217.3 | 218.4 | 208.9 |
| Steam inlet (av.) | 220.2 | 220.2 | 212.7 |
| **Temperature ratio:** | 97.8 | 98.6 | 97.1 |
| Weights of water, lbs | | | |
| Total condensation | 5.08 | 5.76 | 49.02 |
| Condensation per hour | 17.69 | 18.92 | 16.34 |
| Total steam passed | 2.40 | 0 | 0.10 |
| Steam passed per hour | 0.80 | 0 | 0.03 |
| **Condensation ratio** | 95.6 | 100 | 99.8 |

### By Sterling Engineering Company

We consider a discussion of the tests by the manufacturers, an excellent idea and gladly contribute our answers to your questions as follows:

Question 1. We have means of testing our products under operating conditions. All traps sold by us are tested before they are placed in stock.

Question 2. We have tested our traps along the lines followed by the National Association of Building Owners and Managers. Our results were the same as those obtained in the test by the National Association of Building Owners and Managers, with the exception that our temperature ratio on test No. 3 was about 1% higher.

Question 3. We consider that the tests do give accurate comparative data, although we do not consider that operating conditions are exactly duplicated, as, without doubt, care was taken to see that the apparatus was entirely free from any accumulations of pipe scale, dirt or grease. The tests show that most traps on the market will function with a high degree of efficiency when operated under ideal conditions, but actual experience has proven that many traps are inefficient, in fact, either leak quantities of steam or cause water of condensation to accumulate in the units of radiation due to their inability to pass particles of dirt and scale. It has always been our object in building radiator traps to build a trap that would clear itself of dirt and scale by placing the diaphragm and seats in the trap in such relation and position and also by providing large openings through the seat so that the water of condensation would not only carry the accumulations past the seat but prevent them from lodging in the trap chamber.

**THE QUESTIONS**

1. Do you have means for testing your products under operating conditions?
2. Have you tested your traps along the lines followed by the National Association of Building Owners and Managers and, if so, wherein do the results differ?
3. Do you consider that the three tests referred to are sufficient to give accurate comparative data? (We are referring here to laboratory tests only.)
4. Do you consider the performance of your trap, as reported in these tests, indicative of its action under service conditions? If not, please state why.
5. What do you consider should be the results to be desired in a test of your trap? (Such as passing steam etc.)
6. Have you any general criticism of the tests as reported?

Question 4. We consider the performance of our trap as reported, indicative of its action under service conditions.

Question 5. To answer this question fully it is necessary to consider the various tests individually. Test No. 1 was made under as great a differential in pressure between supply and return line as is practical in a well-designed heating system. Furthermore, 10 in. of vacuum is the maximum degree of vacuum used in well-designed systems; in fact, it is several inches higher than is usually maintained. Under a 10 in. vacuum water boils at 192.2°, therefore, water of condensation entering the return from the radiator trap at higher temperatures must re-evaporate until the temperature of the remaining water in the return has dropped below that temperature. It is therefore evident that traps which discharge water above 192.2° will show a greater amount of steam wastage with the apparatus used in this test, than when tested under a lower vacuum or under no vacuum.

From our own experiments we have concluded that in order to vent a radiator thoroughly and keep it free from water, it is essential that the trap discharge its rated capacity of water at a temperature of not less than 200°. We have therefore established a rule that all traps produced by us must discharge their rated capacity of water at not less than 200° F. Under this test (No. 1) our traps showed a condensation ratio of 95.6% which we consider an ideal result and the fact that on tests No. 2 and No. 3 they showed condensation ratios of 100% and 99.8%, respectively, is evidence that the traps were absolutely steam tight in all cases and that the steam lost in test No. 1 was entirely due to re-evaporation.

The operation of a trap that is 100% steam tight and shows a temperature ratio of 98% is so close to being perfect that there is little room for argument. Tests No. 1 and No. 2 of our traps showed 97.8% and 98.6% temperature ratios, respectively. Test No. 3 showed 97.1%, which is about 1% lower than on tests made by us under similar conditions. On test No. 1 our trap showed an average water depth in the radiator of 0.26 in., test No. 2 showed 0.23 in. and test No. 3 an average of 0.20 in. In no case was the depth of the water sufficient to fill the nipple leading to the trap. The results of the tests of our traps showed that under ideal laboratory conditions they were 100% steam tight, that they produced an average temperature ratio of 98% in the radiator and that at no time they caused water to accumulate in the radiator to a depth greater than the opening in the trap nipple. A number of other traps produced approximately the same results, showing that under laboratory conditions the majority of the traps tested are highly efficient.

We consider the results attained in this test of our traps highly satisfactory and all that is to be desired.

Question 6. We concur with the Hoffman Specialty Company in their criticism published in the April issue in answer to this question. We refer to this criticism in order to avoid useless repetition.

In addition to their remarks we wish to call attention to the apparent discrepancy in tests No. 2 and No. 3, trap No. 9. Both of these tests showed water accumulation in excess of 1 in. and in one instance as high as 2 in. yet temperature ratios of 98.7% and 98.2%, respectively, are shown; also the total condensation passed in these tests compares very favorably with the total passed by other traps where there was little or no accumulation of water. In test No. 3 of trap No. 14 a similar accumulation of water occurred with a temperature ratio of 97.2% but with a

(*Continued on page 70*)

# Engineering Pro

Educational Research House of
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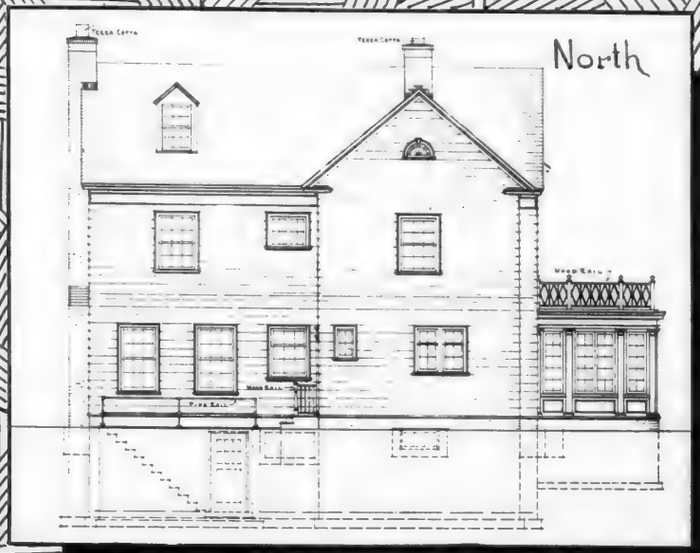

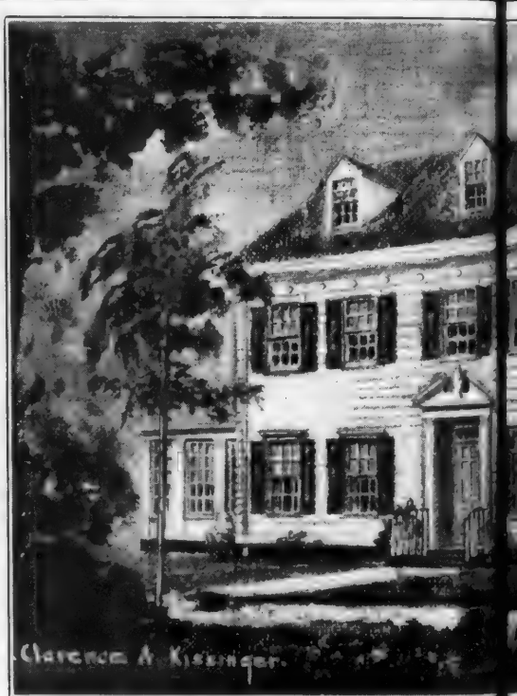


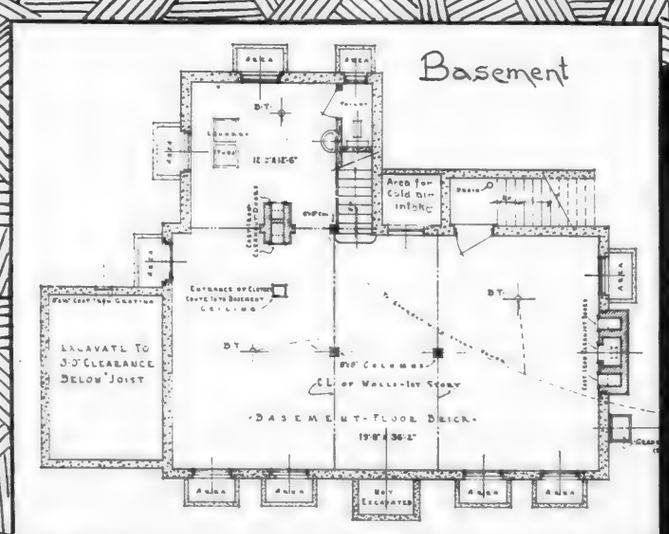


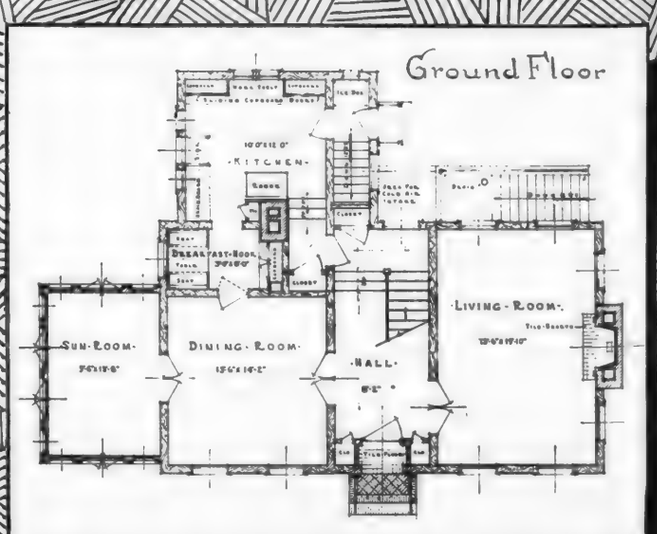

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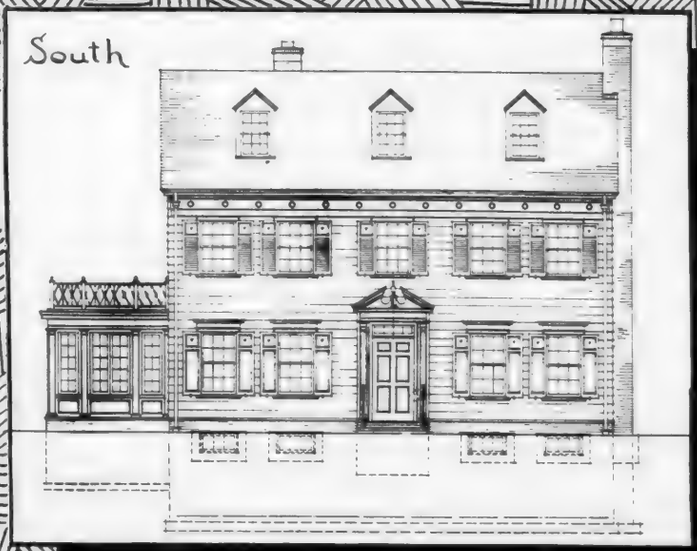
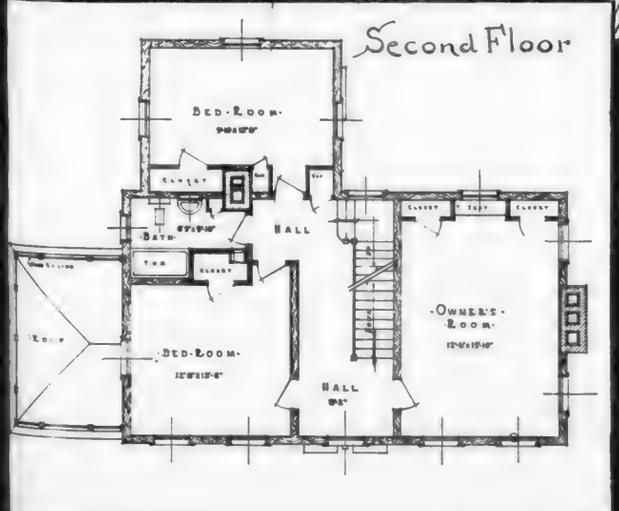
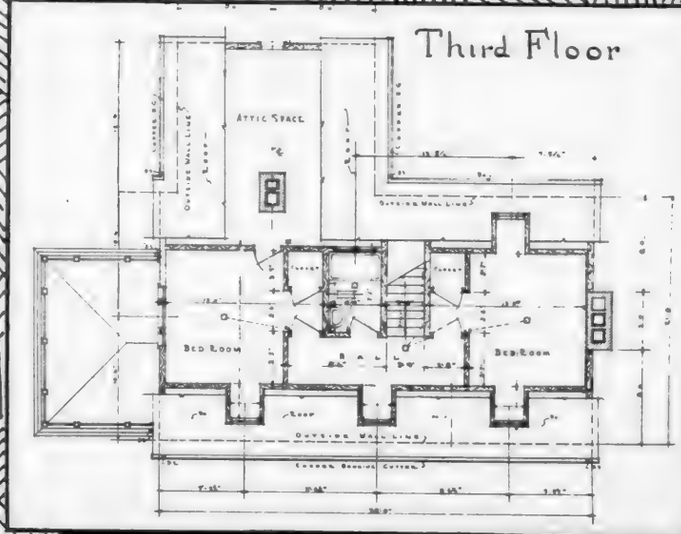




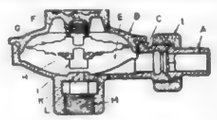
## Operating Characteristics of Radiator Traps

(*Continued from page 67*)

drop in total condensation to 37.41 lbs., while in the two above-mentioned tests of trap No. 9 the total condensation was 45.3 lbs. and 50.56 lbs. respectively. The above results either indicate an error in the data taken or it indicates that accumulation of water in the bottom of the radiator is not detrimental to heating efficiency; or, in other words, temperature ratio. To the writer this is a rather interesting question which he believes should be the subject of further investigation.

Although the following remarks are not in answer to any of your questions we believe that a discussion of the merits of this test should not be made without reference to the incorrect impression given when a portion of the test results are quoted, without any reference to the complete results, as this is likely to give the public a false impression of the actual results obtained. We consider that this is neither fair to those who conducted the test nor to the other manufacturers who participated in same.

**N.A.B.O.M. Test Results of Dunham No. 2 Trap, Liquid Thermostatic Type**



Dunham No. 2, Liquid Thermostatic Type.

| | First test | Second test | Third test |
|---|---|---|---|
| Date of test | Aug. 26, '22 | Aug 25, '22 | Aug. 25, '22 |
| Barometer reading, in | 29.39 | 29.20 | 29.20 |
| Temperature readings, deg. F. | | | |
| Room (av.) | 78.0 | 78.8 | 82.2 |
| Radiator (av.) | 219.8 | 219.1 | 211.9 |
| Steam inlet (av.) | 220.6 | 220.3 | 212.5 |
| **Temperature ratio:** | **99.4** | **99.1** | **99.5** |
| Weights of water, lbs. | | | |
| Total condensation | 58.21 | 51.98 | 9.36 |
| ondensation per hour | 19.40 | 18.35 | 4.2 |
| Total steam passed | 2.16 | 0.05 | 0 |
| Steam passed per hour | 0.72 | 0.02 | 0.07 |
| **Condensation ratio:** | **96.4** | **99.9** | 2 |

### By the C. A. Dunham Company

1. We have available apparatus for testing our product under operating conditions. The equipment possessed by this company will permit us to secure any desired operating condition met with in heating practice.

2. The C. A. Dunham Company constantly makes tests upon its traps along similar lines as those followed by the National Association of Building Owners and Managers. We go further, however, to open up information which the committee of this association, so far, at least, has failed to get. Should they complete their work, the results will be practically the same.

3. We believe that the three tests conditions referred to are sufficient to give fairly accurate comparative data, provided the data are properly interpreted. It will be recalled, in this connection, that one phase of a research investigation is the complete interpretation of the test results.

4. The performance of the Dunham trap, as shown by the test data, was a fair indication of its action under service conditions. Attention is directed to the need for re-evaporation allowance in working up the report from the test. When the test data secured by the committee have this correction applied to them, the Dunham trap gave an average performance materially in excess of 99% under each one of the rating factors; that is, it released substantially all water and air, without passage of any steam.

5. The performance of the Dunham trap, with proper interpretation of the results, was excellent.

6. Our criticism of the tests lies more in the failure to properly interpret the data rather than in the tests themselves. Attention is also directed to the need for correcting the condensation ratio for re-evaporation. The test apparatus as used by the committee did not permit securing the data to make this possible accurately, because no thermometer was located so as to indicate the temperature of water leaving the radiator.

It should always be noted that the accumulation in the steam pot must be considered in relationship to the quantity of water in the radiator. Some quantitative relation or basis the water accumulated in the radiator, should be considered in connection with both at the end of the test and at various times during the test period. Water accumulation in the radiator under given conditions, might have disastrous results. Moreover, it is no credit to a trap to cause very low outlet temperature of the radiator, when in doing so it accumulates large quantities of water in the radiators. In the case of a water-type radiator, which was the type used by the committee, a comparatively low height of water in the radiator may be a very appreciable quantity of water. Over long operating periods this entrained water promotes an accumulation of air, causing a serious drop in radiator efficiency.

We believe it would have been preferable to have started each test with a radiator cold, taking observations of the things occurring during the time the radiator was warming, the same period of time being allowed for the radiator to come up to temperature in each case, so that the action of the trap in allowing the radiator to come up to temperature could have been observed. The committee allowed the radiator to come up to temperature before starting the test, so that a comparison of the action of various makes of traps under warming conditions is not available.

## Philadelphia Building Congress Evolves New Designations for Employers and Workers in the Building Industry

A significant announcement is made by the Philadelphia Building Congress to the effect that it is about to issue engrossed certificates to all classes of those engaged in the building industry, from the mechanics to the architects and engineers.

Mechanics, artisans and skilled workers may qualify for certificates as Craftsmen. Those now designated as improvers, helpers, etc., will become Assistant Craftsmen. Apprentices, learners, etc. will be known as Junior Craftsmen. Those engaged in any of the crafts who have shown special skill in developing the artistry or handicraft possibilities in their particular field of work, will be designated Guildsmen.

Architects and engineers, who have designed, specified and supervised buildings which have been successfully erected, who have shown knowledge of appropriateness of design with the most advantageous use of materials, and who have encouraged pride of craft on the part of co-workers and have given individual recognition of it when deserved, are to be given the designation of Master Craftsmen. Finally, builders and subcontractors, who have satisfactorily either erected buildings or other structures or parts thereof, or installed equipment therein, and have encouraged pride of craft on the part of co-workers and have given individual recognition of it when deserved, will be known as co-operating Master Craftsmen.

The first step in this ambitious program will be the compilation, by the Philadelphia Building Congress, of the names and addresses of all field workers in the building industry in the Philadelphia metropolitan district (as distinguished from shop workers engaged in the manufacture of building materials) who are qualified to perform and are performing satisfactory services in their respective crafts or in related lines of work. The names and addresses will also be secured of all builders, subcontractors or other employers who encourage such workers and afford them opportunities to do their best to improve themselves, and of all architects and engineers who encourage their co-workers in the service of owners and the community to become better craftsmen or workers.

The award of the certificates will be made as soon as practicable after the end of the current year. It is planned to issue new certificates each year, if the recipients are considered to be again entitled to them, either in the same or another class.

If the present program is a success, a further step will be taken in designating common laborers, unskilled laborers, or "helpers," as Construction Workmen.

## Heating and Piping Contractors National Association

(*Continued from page* 62)

ard roughing-in dimensions of the Heating and Piping Contractors' National Association. We bring up this matter particularly at this time for the reason that we have tentatively adopted roughing-in dimensions for modulation and steam supply valves. When it is considered that these roughing-in dimensions bring down to a standard length about twenty-eight divergent dimensions without entailing any particular hardship on the manufacturers, you can realize the distinct advantage that there is to every member of this association to insist that the matter be given the co-operation and consideration of the manufacturers, some of whom relying on their size and strength laugh at the so-called arbitrary decisions of this association or its Committee on Standardization.

"To summarize the work that the Committee on Standardization has accomplished this year, first, we have worked up exposure factors and base temperatures for five additional cities and have developed a chart for each city, giving the square feet of radiation directly from the chart. This, after all, is the biggest piece of constructive work that we have done."

On the matter of the selection of boilers, the report told of the meeting of the Committee on Standardization with the Code Committee of the A. S. H. & V. E., adding, "as we disagreed with Mr. McIntire (chairman of the sub-committee on boilers) on several very essential points, and as Mr. McIntire agreed to give consideration to our opinion, our work with him is likely to be of distinct advantage to this association."

The committee was also active in offering suggestions for the standardization of hot water storage tanks being undertaken by the Department of Commerce, and has again acted as sponsor for the American Engineering Standards Committees' proposed code on pipe fittings, and flanges, and has been represented on the Committee on Code for Identification of Piping Systems.

NEXT YEAR'S PROGRAM

The committee recommended the following work as essential for the developing of the Associations' "Engineering Standards Book," as well as general standardization for the association.

1. The extension of standard roughing-in dimensions for radiator valves.
2. A standard method of selecting boilers.
3. A further extension of exposure factors and base temperatures to other cities than those we had developed.
4. A study of sheet-metal work and sizes for indirect heating.
5. Proper sizes and heights of chimneys.
6. Pipe sizes for low-pressure heating.

In concluding its report, the committee stated that the work it has taken upon itself to do in the last few years has brought the association before the technical bodies of this country in such a way that extreme care must be used in presenting any matters for publication. We have practically challenged all of the technical engineering societies because of the work that we have done, which they feel rightfully should have been done by them. Consequently, your association and your committee on standardization is no longer a local body and in its future work and in the development of methods and formulas, it must be in a position to defend itself against the highest lights of any other engineering body.

BUSINESS SESSIONS

Both the afternoon session on Wednesday and the morning session on Thursday were held behind closed doors. At these sessions were presented the reports of the treasurer, Frank W. Howard, the reports of the convention committees, including the committee on resolutions; the reports of State and local secretaries and an address by E. L. Bowman on "Supply and Training of Journeymen Steamfitters."

At the open session Thursday afternoon announcement was made of the election of officers for the coming year, followed by their installation. This brought the convention to a close.

# Legal Decisions

### Increase in Heating Rates Cannot be Based on Imprudent Coal Contract

A petition by a central station heating company for increased heating rates was denied by the Indiana Public Service Commission, where it appeared that the necessity for the increase was caused by an imprudent coal contract made by the management. The Citizens Mutual Heating Company, serving 259 residences and other buildings in Terre Haute, a total of 210,000 feet of radiation, which was the entire capacity of the plant, at rates of 34 cents per square foot of connected radiation, asked for an increase of 3½ cents per square foot of installed radiation to pay its operating expenses and earn a reasonable return (7%) on the fair value of its property.

It appeared that in September, 1920, the company had entered into a five-year contract for coal at $3 per ton at the mine, which appeared to be a reasonable price at that time, but later the price declined radically and never again reached that figure. The commission took into consideration the company's delay in making efforts to procure a coal contract, notwithstanding the railroad strike in the fall of 1919, which caused the unsettled conditions.

The company based its request for increased rates chiefly on the necessity of changing from two twelve-hour to three eight hour shifts in the operation of its plant. The commission took into consideration the fact that the company's manager knew of this increase in operating expense in April or May, but the petition for an increase was not filed until August. The commission says that "this is, as a general rule, a practice unfair to consumers because if the commission authorizes an increase consumers unwilling or unable to pay the increased rates have no opportunity to install their own heating plants."

"The commission," the opinion reads, "has never followed the policy of interferring unduly with the management of the utilities of this state and does not desire in this case to usurp any of the managerial functions that appertain properly to petition's officers; but the commission will not by increasing petitioner's rates as requested in their petition herein, throw on to the shoulders of petitioner's consumers a loss of $9,000 per annum occasioned by petitioner's managerial mistakes. As between petitioner's consumers and its stockholders, a loss occasioned by the acts of its managerial officers must fall upon the stockholders and cannot be passed on to the public."

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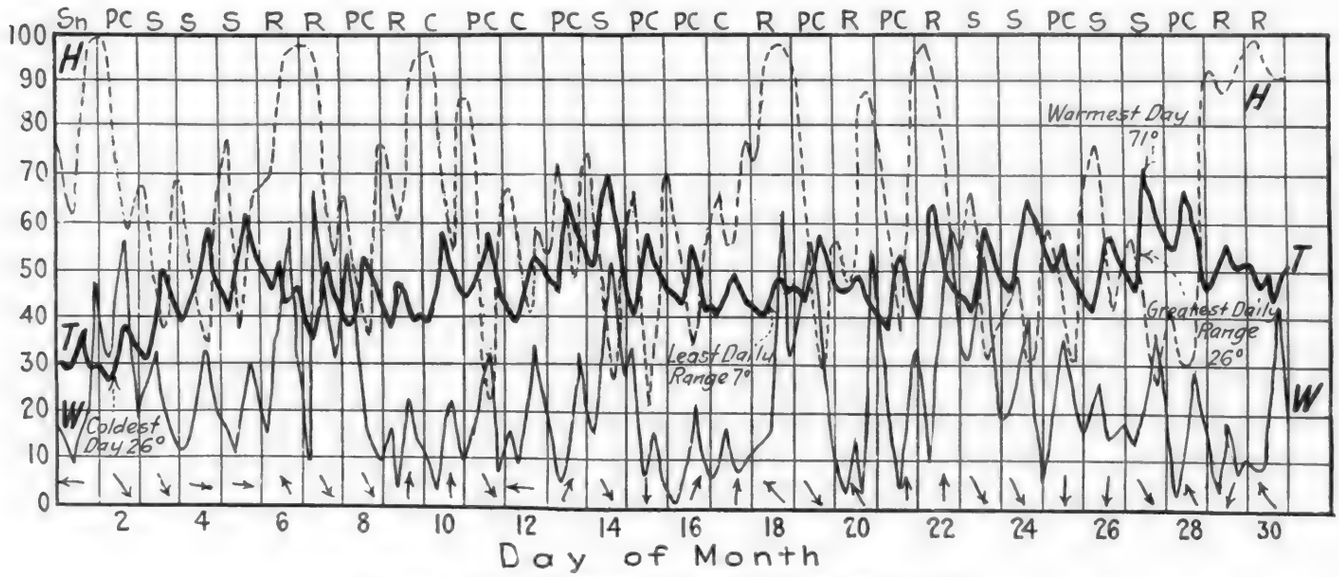
### Lessee Held Liable for Destruction of Building by Fire Caused by Its Defective Heating System

In an action by the owner of a building against a school district it appeared that the plaintiff leased her building to the defendant for school purposes. As a part of the contract of lease the defendant agreed to make such changes as were necessary to fit the building for school purposes, and to return the property in as good shape as when received. No rent was to be paid, but any improvements made by defendant were to belong to the plaintiff at the termination of the lease. The jury found that the heating system was defectively and negligently installed; that the flue was negligently constructed and that the fire which destroyed the leased building resulted therefrom; and the testimony showed that notice of such defective construction and of the likelihood of fire resulting therefrom was given by the plaintiff to the defendant school board several weeks prior to the fire. In other words, the fire which destroyed the leased building was chargeable to, and was the result of defendant's negligence. A verdict for the plaintiff was therefore sustained.

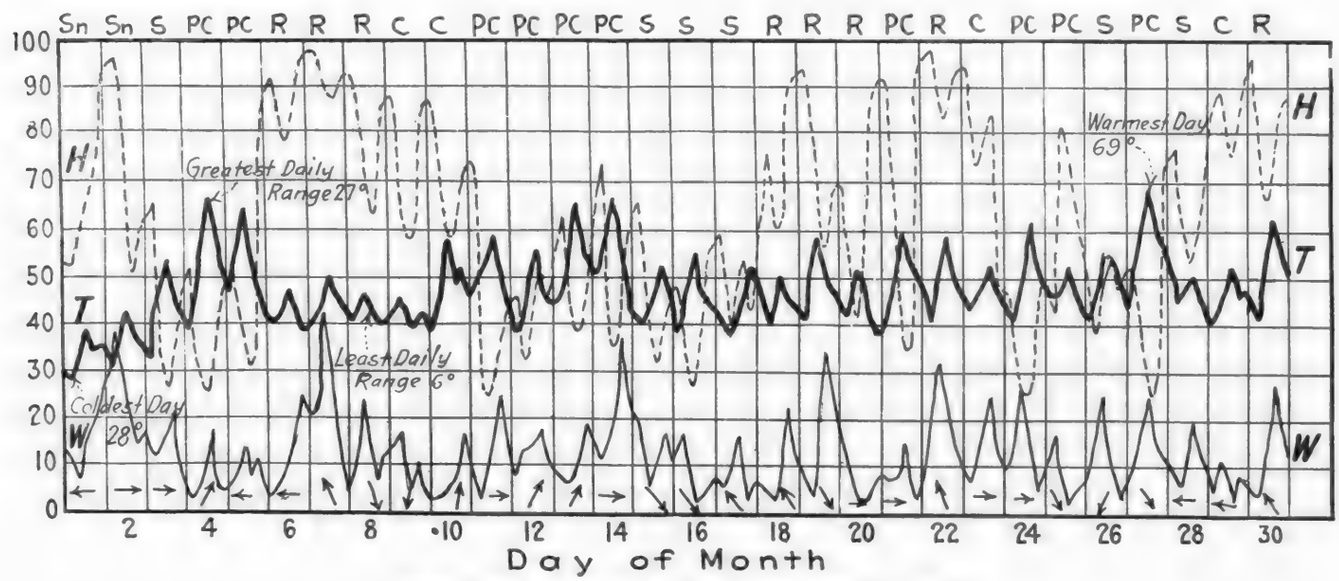
# The Weather for April, 1924

| | New York | Boston | Pittsburgh | Chicago | St. Louis |
|---|---|---|---|---|---|
| Highest temperature, deg. F. | 71 | 69 | 72 | 76 | 86 |
| Date of highest temperature | 27 | 27 | 24 | 24 | 16 |
| Lowest temperature, deg. F. | 26 | 28 | 26 | 23 | 25 |
| Date of lowest temperature | 2 | 1 | 2 | 1 | 1 |
| Greatest daily range, deg. F. | 26 | 27 | 31 | 26 | 32 |
| Date of greatest daily range | 27 | 4 | 24 | 13 | 2 |
| Least daily range deg. F. | 7 | 6 | 8 | 7 | 8 |
| Date of least daily range | 18 | 8 | 1 | 1 | 4 |
| Mean temp. for month, deg. F. | 48.1 | 47.2 | 49.8 | 49 | 58.4 |
| Normal mean temp. for month, deg. F. | 49.4 | 46.4 | 51.2 | 47.7 | 55.8 |
| Total precipitation, in. | 4.53 | 3.79 | 3.09 | 0.84 | 1.9 |
| Total snowfall, in. | 8.0 | 3.0 | 3.2 | Trace | None |
| Normal precipitation, in. | 3.3 | 3.55 | 2.9 | 2.88 | 3.52 |
| Total wind movement, miles | 14981 | 8246 | 8188 | 7898 | 10284 |
| Average hourly wind velocity, miles | 20.8 | 11.4 | 11 | 11 | 14.3 |
| Prevailing direction of wind | N. W. | W | W | W | S |
| Number of clear days | 8 | 6 | 7 | 6 | 10 |
| Number of partly cloudy days | 10 | 15 | 7 | 13 | 9 |
| Number of cloudy days | 12 | 9 | 16 | 11 | 11 |
| Number of days on which rain fell | 8 | 10 | 13 | 9 | 8 |
| Number of days on which snow fell | 1 | 2 | 3 | 10 | None |

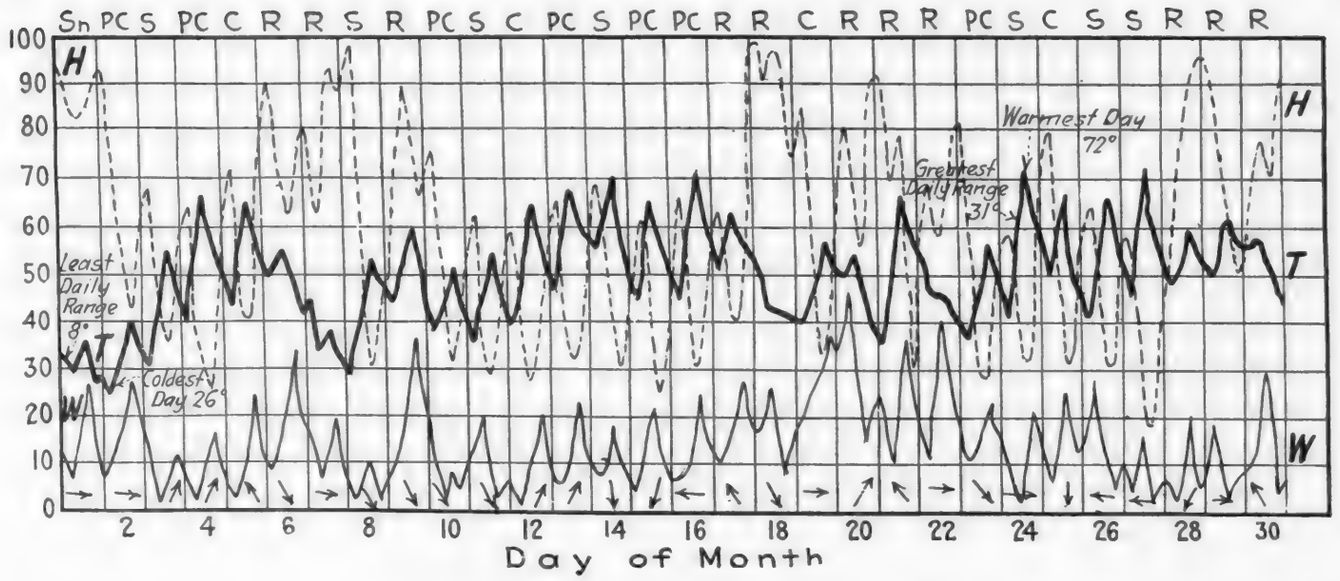



**Record Of the Weather in New York for April, 1924**

(Hourly Readings of the Relative Humidity Plotted on this Chart)




**Record of the Weather in Boston for April, 1924**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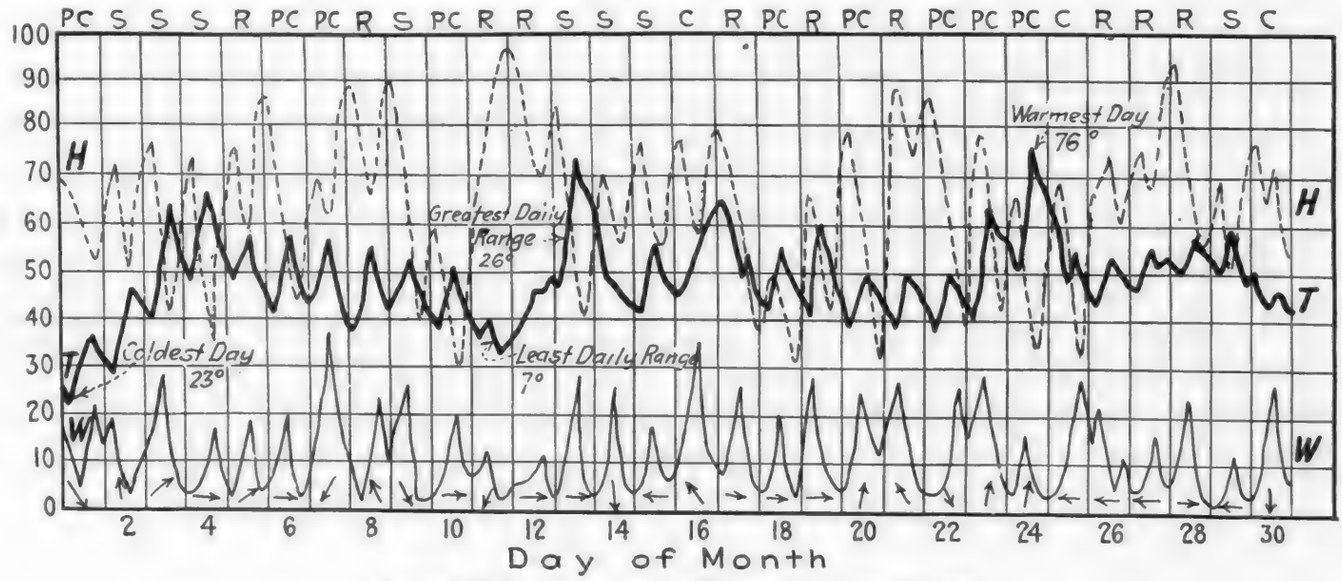
Greatest Daily Range 31°
Least Daily Range 8°
Coldest Day 26°
Day of Month

**Record of the Weather in Pittsburgh for April, 1924**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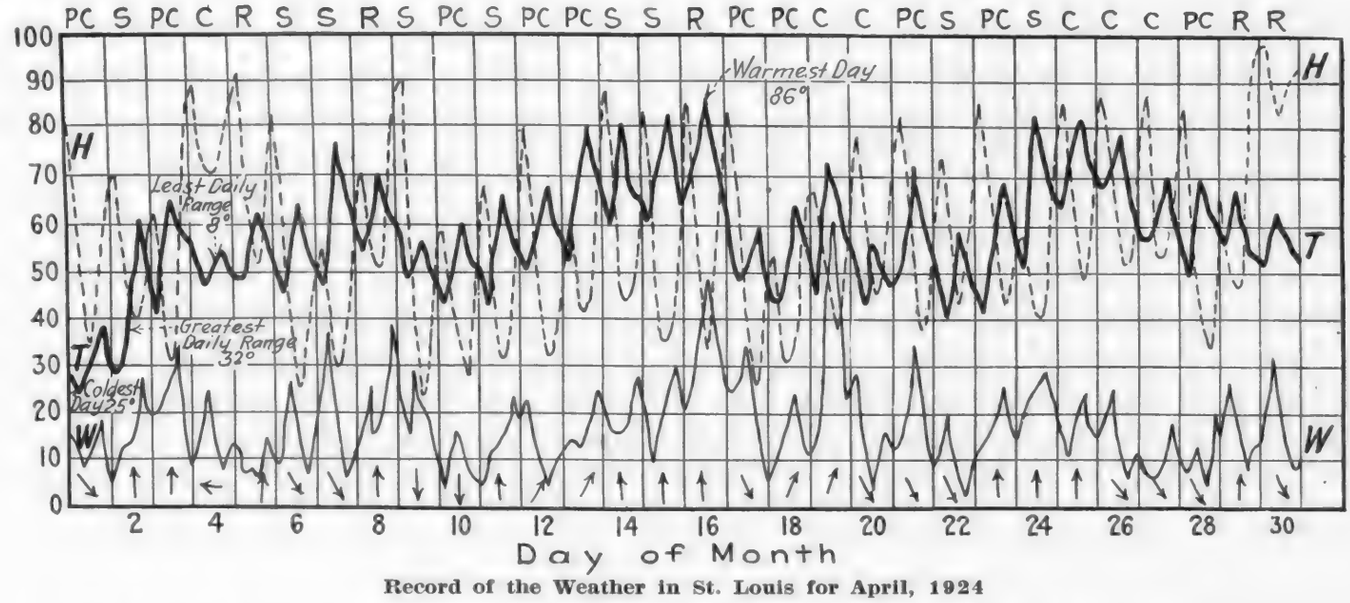
Warmest Day 76°
Greatest Daily Range 26°
Coldest Day 23°
Least Daily Range 7°
Day of Month

**Record of the Weather in Chicago for April, 1924**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Warmest Day 86°
Least Daily Range 8°
Greatest Daily Range 32°
Coldest Day 25°
Day of Month

**Record of the Weather in St. Louis for April, 1924**

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A. M., 12 M., and 8 P. M.
S—Clear, PC—partly cloudy, C—Cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

# Organization of the Williams Institute of Heat Research to Study Oil Burning Problems

## 1.—The Measure of an Oil Burner

A significant step in the oil-burning field has been taken in the organization of the Williams Institute of Heat Research, in Bloomington, Ill., with Walter W. Williams, president; Grover C. Pledger, registrar; and Chester J. Scanlan, director.

In an announcement of its activities, the institute states that "much information is being broadcast that should and should not be, and, therefore, this organization has dedicated itself to the purpose of giving to the public a definite scientific knowledge of oil-burning." In addition, the institute has also undertaken the education of dealers, salesmen, service men and users to the proper methods to be followed in expanding the field.

"The art of satisfactorily burning oil," states the initial bulletin of the institute, "dates back a considerable span of years. The experience of this period led to the development of two widely-known and widely-used types of burners, namely: (1) the spray atomizer type and (2) the mechanical atomizer type.

"The spray type uses either steam or compressed air to secure the proper atomization or breaking up of the oil, while the mechanical type merely forces the oil under pressure through a small hole similar in effect to the common garden hose. Because of the expense involved in producing steam or compressed air, the spray type is little used to-day. The mechanical type finds a large field where frequent cleaning of the burner nozzle is not a drawback.

"With the advent of the domestic fuel-oil burner, engineers found it quite difficult to apply the principles embodied in the spray and mechanical types to this new use. They, therefore, developed a new type of burner which is logically named, 'Generative.'

"This last class includes all types that vaporize the fuel by means of hot plates, hot pots, hot tubes or other hot portions of the device. The means by which the oil is delivered, whether gravity or power, is not of importance in this classification.

"Because, with this later type of burner it is practically impossible to burn the heavier grades of fuel-oil, without an undue formation of carbon an residue, another type, while not exactly new, being a combination of the spray and mechanical types, was developed.

"In this latest type, air and oil are combined in a pump and are discharged together through the orifice. Since air and oil are discharged together, a larger hole may be used, thus eliminating considerable cleaning of the nozzle. This arrangement also permits of adjustments which cause the flame to burn free from all parts of the device.

### OIL-BURNING SUBJECT TO FIXED LAWS

"After a careful analysis and study of oil-burning as a chemical process, we find that it obeys certain definite fixed laws, just as do all other physical phenomena. A successful oil burner, then, must be one which embodies certain immutable laws. The following are the laws as expressed by the leading mechanical minds of the country.

"1. The oil must be atomized, not vaporized.

"2. The oil must be burned in suspension, before it comes in contact with any surface.

"3. The oil must be burned in the presence of a refractory material.

"4. A fixed minimum quantity of air must be supplied for combustion and mixed mechanically with the atomized oil.

"'The oil must be atomized' means that the oil must be broken up into infinitely small particles. Each particle, however is liquid oil. So vaporizing the oil spells trouble, because carbon and non-combustible are deposited. A homely example of this is the boiling of salt water. The water boils away, leaving the salt. Likewise, the lighter portions of the oil boil away, leaving the free carbon and non-combustible remaining.

"Now it is quite true that nothing will burn until it is converted into a gas. But 'the oil must be burned in suspension' tells us that each minute particle of oil must be evaporated in mid-air and not in contact with any surface, thereby permitting the free carbon to burn and the non-combustible to be blown out with the flue gas.

"The presence of the refractory accomplishes this result, because it reflects heat back into the combustion zone to vaporize the oil particles as they are blown from the burner nozzle into space.

"In order that each particle of oil will be provided with the proper amount of oxygen to properly burn it, the air must be so mixed that it will reach every particle. A minimum amount should be used in order to reduce the stack loss.

"The prospective oil user or dealer will find the four principles of oil-burning, as enumerated above, a trustworthy measure of the quality of any oil burner."

## Officers of American Association of Oil Burner Manufacturers

The full list of officers of the American Association of Oil Burner Manufacturers, elected at its recent annual meeting in St. Louis, is as follows: President, Edward P. Bailey, National Oil Burner Co., Philadelphia, Pa.; vice-presidents; Ernest H. Peabody, Peabody Engineering Corp., New York; L. P. Ordway, Jr., Winslow Boiler & Engineering Co., Chicago; A. M. Lockett, A. M. Lockett, Ltd., New Orleans, La.; J. L. Voorheis, Coen Co., San Francisco, Calif.; Lionel L. Jacobs, Fess Oil Burners of Canada, Ltd., Toronto, Canada.

The board of directors is composed of the following: Wallace C. Capen, Home Appliance Corporation, St. Louis, Mo.; C. H. Chalmers, Chalmers Oil Burner Co., Minneapolis, Minn.; R. P. Flower, Gill Mfg. Co., Chicago; John Scheminger, Jr., Aetna Automatic Oil Burner Co., Providence, R. I.; H. A. Tiffany, Subrasco-Tiffany Oil Burner Co., Paterson, N. J.

## List of Approved Oil Burners

In response to numerous requests, the following list is presented of domestic oil burners which have been tested and found to comply with the specifications and standards of the Fire Underwriters' Laboratories of the National Board of Fire Underwriters; the list is that published by the laboratories:

Caloroil and Caloroil Type A (Caloroil Burner Corporation, New York.) Designed to burn kerosene or distillate of 36° to 40° Baumé.

Combustion Type C. (Combustion Co., Chicago). Designed to burn distillate of 24° to 36° Baumé.

Kleen Heat Type G (Winslow Boiler & Engineering Co., Chicago). Designed to burn kerosene or distillate of 36° to 40° Baumé.

Lillibridge Types 38-D, 68-D, 99-D, and 9-11-D (Lillibridge Heating Corporation, Hutchinson, Kan.). Manually-controlled oil vapor burner, designed to burn kerosene or distillate of 36° to 40° Baumé.

Nokol (American Nokol Co., Chicago). Designed to burn kerosene.

Oil-O-Matic Types D, E and F (C. U. Williams & Son, Bloomington, Ill). Designed to burn kerosene or distillate of 30° to 32° Baumé.

Quinn (Quinn Oil Burner Corporation, Port Richmond, Staten Island, N. Y.). Manually-controlled oil vapor burner designed to burn kerosene or distillate of 36° to 40° Baumé.

Scott-Newcomb (Home Appliance Corporation, St. Louis, Mo.). Designed to burn kerosene or distillate of 36° to 40° Baumé.

Skinner Type A (Skinner Engine Co., Erie, Pa.). Designed to burn kerosene or distillate of 35° to 45° Baumé.

Type 22 (S. T. Johnson Co., San Francisco, Cal.). Manually-operated oil burner, pump-feed type, without automatic means for closing oil supply to the burner in event the flame is extinguished. Designed to burn fuel-oil 24° to 36° Baumé. (This is standard for use where a competent attendant is constantly on the premises).

# New Apparatus and Appliances

## New Univent Design, with Copper Radiating Surface

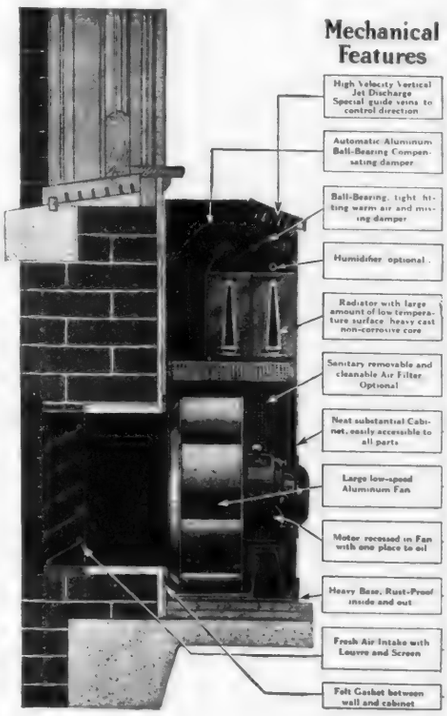
Engineers and others in the field of ventilation will be interested in a new model Univent, which has just been placed on the market by the Herman Nelson Corporation, Moline, Ill., after seven years of investigation and research in this field. It is described as a radical departure, in many ways, from anything of its kind that has yet appeared on the market.

In the first place, a new type of copper radiator has been used which occupies one-fourth the space and weighs one-sixth as much as a cast-iron radiator required for a machine of the same capacity. This, together with the application of a single unhoused fan in which the motor is partly recessed, has made possible the building of a ventilator of much smaller dimensions, which can be placed in school-room aisles or elsewhere without the usual objections to their locations at these points. It is stated that the Model S Univent extends no further from the wall than a 3-col. radiator, if the latter is properly set.

The new Univent radiator is of the extended-surface type, having a triangular-shaped core on which copper plates are pressed by a unique process. The core has a continuous passage through which the steam passes and the heat from the core is transmitted to the plates by conduction. The claim is made that in this new radiator the mean temperature of the surface over which the air passes when the Univent is in operation does not exceed 135° F., as compared with steam radiator temperatures of from 212° to 218°, yet the largest Univent has a rated capacity for heating 1350 cu. ft. of air per minute from zero to approximately 100° F. This is due to the fact that it is possible to use a comparatively large amount of surface, as many as 400 plates being used on one radiator.

No soldered or brazed joints are used in the construction of the radiator. This feature, it is pointed out, reduces the danger of damage by handling or shipping and permits constant expansion and contraction. Because of the smooth passages through the radiator, coupled with a newly-designed fan, the manufacturer states that the electric current consumption required to operate a unit ventilator has been reduced 50%, notwithstanding the fact that the new Univent is equipped with an air filter which is also characterized as a departure in apparatus of this kind.

New Design of Univent, Showing Copper Radiator, Air Filters and Fan


Mechanical Features
High Velocity Vertical Jet Discharge Special guide veins to control direction
Automatic Aluminum Ball-Bearing Compensating damper
Ball-Bearing, tight fitting warm air and mixing damper
Humidifier optional
Radiator with large amount of low temperature surface heavy cast non-corrosive core
Sanitary removable and cleanable Air Filter Optional
Neat substantial Cabinet, easily accessible to all parts
Large low-speed Aluminum Fan
Motor recessed in Fan with one place to oil
Heavy Base, Rust-Proof inside and out
Fresh Air Intake with Louvre and Screen
Felt Gasket between wall and cabinet

Mechanical Features of New Univent Design

The filter is of the adhesive impingement type. A screened frame extending crosswise of the air passage holds a blanket of steel wool, coated with adhesive oil, to catch the dirt, dust and soot. The filter is removable and cleanable.

The new Univent is made in two models, Model R and Model S. They are essentially the same, except that Model R is provided with means for recirculating the air in the room, whereas Model S is not.

A remarkable catalog in colors (architects' and engineers' edition) on Univent Ventilation has just been issued by the Herman Nelson Corporation, which goes at length into the history of ventilation and the developments which have led up to the present state of the art. In addition to details in colors of the new models, in which every construction feature is clearly shown, views are given of the course of the air in school rooms equipped with Univents, based upon test data which are also given. The latter part of the catalog is devoted to engineering data and detailed drawings, including no less than eleven plates of various arrangements. There are also capacity tables and charts, the catalog concluding with a suggested set of specifications. Size of catalogue, 8½ x 11 in. Pp. 84.

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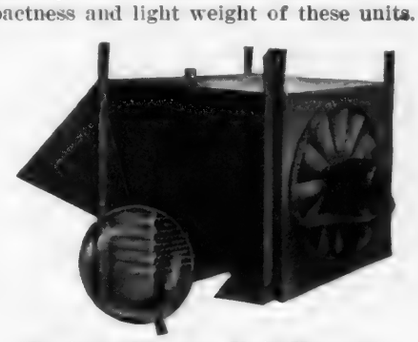
## The Comet Unit Heater

One of the latest types of unit heater to appear with a copper radiator is the Comet unit heater, which has been brought out by the New York Blower Co., Chicago, Ill. This heater, like others of its type, comes complete in itself, and needs only to be fastened in position with eight bolts and connected to steam and electrical lines. The fan used with this heater is of the heavy-duty disc type and is supported on the motor shaft. Both motor and fan are supported on a cast-iron base built integral with the cast-iron frame.

The copper heater used is of the Cartridge type. It is made of extruded copper and has a honeycomb appearance, as already described in these columns. As will be seen from the illustration, the heating coil has a chamber for steam at the top and for condensation at the bottom, both tapped standard pipe size. Any steam pressure up to 10 lbs. may be used.

The casing enclosing the Comet unit heater is cold-rolled furniture steel with angle supports, punched for floor, wall or ceiling suspension. Special emphasis is laid by the manufacturer on the compactness and light weight of these units.



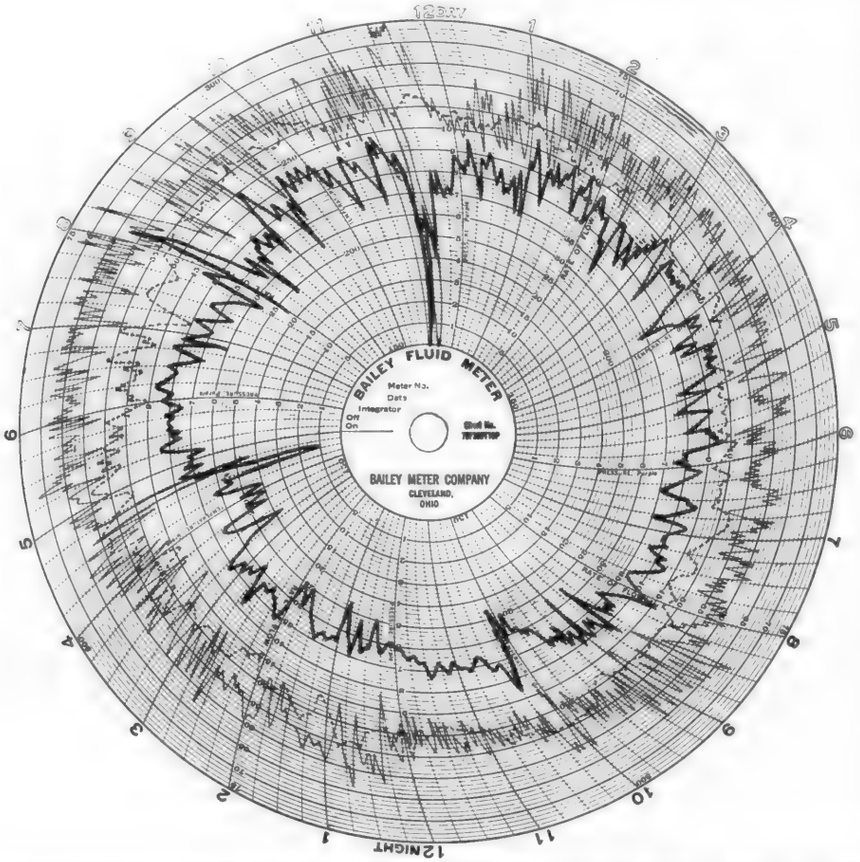
Design of Comet Unit Heater

These features make it possible to fasten the heater to any part of a building structure, usually without making any provisions for bracing or support. The heater is made in four sizes, and each size can be had with a narrow coil 3⅞ in., air travel, or with a wide coil 5 in. air travel. The company does not recommend the narrow coil when the temperature of the entering air is below 20° F.

In a circular describing the Comet unit heater, details are given of the dimensions, steam connections and capacities for each size and for various conditions of entering and leaving air temperatures.

## Remarkable Steam Flow Curve in a Central Steam Heating System

The accompanying curve shows the remarkable operating characteristics obtained in connection with steam flow and pressure in the central station heating system of the Springfield (O.) Light, Heat and Power Company. The chart, which is furnished us through the courtesy of Superintendent P. A. Hyde, of the Steam Heating Department, is taken from a meter used on the company's low-pressure heating system for metering the total send-out of steam from the plant. The meter is corrected for pressure in temperature and shows the demand in that respect, as well as the remarkable line carried on the steam, both as to flow and pressure. The reading was for January 21, 1924.




**One Day's Steam Flow Curve at Central Station Heating System of Springfield (O.) Light, Heat and Power Company**

## Americans at the World Power Conference in London

More than 200 American mechanical, electrical, civil and marine engineers plan to attend the World Power Conference in London, June 30 to July 12, sailing from New York aboard the S. S. Scythia June 19. The conference is being held in connection with the British Empire Exposition.

Not only do the Americans plan to "listen in" at the conference but they will participate in the discussions to a marked degree. At least 37 papers will be presented by engineers of the United States, covering particularly the field of super-power development. Secretary of Commerce Herbert Hoover will attend and present one of the leading papers.

## New Books

DESIGNING HEATING AND VENTILATING SYSTEMS, by Charles A. Fuller, has been published in a new edition, revised and enlarged, by the U. P. C. Book Co., Inc., 239 West 39th Street, New York. New chapters have been added on vapor systems, high-pressure steam for cooking, laundry and process work, and high-pressure boiler-room piping and auxiliaries. The author is at his best in the presentation of steam heating data which is given in concise form for the use of the busy estimator. The chapter on school ventilation quite ignores the more recent developments in this field and continues to follow the "30 cu. ft. per pupil per minute" rule. The author has nothing to say regarding recirculation, ozone or unit ventilation. The fan and indirect heating data are well arranged, although here, again, data on copper heaters would have been a welcome addition. Size 6 x 9 in. Pp. 245. May be had from the publisher or through the book department of THE HEATING AND VENTILATING MAGAZINE.

MARKS' ENGINEERS' HANDBOOK, prepared by a staff of experts under the direction of Professor Lionel S. Marks, professor of mechanical engineering at Harvard University, has been published in a second edition, by the McGraw-Hill Book Co., 370 Seventh Avenue, New York. This work was originally published in 1916 and has already been through eleven printings. Among the contributors to the new edition are Willis H. Carrier, who contributes the chapter on "Air Conditioning and Drying;" and Konrad Meier, who contributes a chapter on "Heating and Ventilation," his compilation being revised by Professor J. E. Emswiler, of the University of Michigan. Both of these chapters reflect the recent developments in the art, especially as regards hygienic requirements in heating and in the matter of ventilation requirements and standards.

Sections of particular interest to heating men are those on "Heat," by Professor G. A. Goodenough of the University of Illinois; on "Power Generation," in which Professor Marks contributes important chapters on internal-combustion engines and on cost of power, the latter data being revised by G. A. Orrok; and on "Engineering Measurements, Mechanical Refrigeration, Etc.," the author of the refrigeration data being Frank L. Fairbanks.

The subject of "Corrosion" is covered by Morgan B. Smith, of the Detroit Edison Company, and "Fuels" are discussed by O. P. Hood, chief mechanical engineer of the Bureau of Mines. The "Centrifugal Fan" data are by E. B. Williams, of the B. F. Sturtevant Company.

The new edition has been increased by about 150 pages to accommodate new matter. Size 4½ x 7 in. Pp. 1986. Price $6.00. May be had from the publishers or through the book department of THE HEATING AND VENTILATING MAGAZINE.

## New York Own-Your-Home Show

Heating and ventilating products were well represented at the "Own-Your-Home" show in New York City.

New York Oil Burner Co., presented the Oil-O-Matic fuel oil burner, which, it is announced, has been listed as standard by the National Board of Fire Underwriters.

The Automatic Gas Kompak water heater, with copper boiler, was shown by the Kompack Co., New Brunswick, N. J., of which J. V. Landreth is the distributor for Greater New York.

Excelso Heaters were offered by the Excelso Specialty Works, Buffalo, N. Y.

Oilheat Systems, Inc., New York, demonstrated its systems for steam boilers, water boilers, pipeless furnaces, warm-air furnaces and other heating systems.

Other manufacturers represented were: Abendroth Brothers, Port Chester, N. Y.; Troop Manufacturing Co., Pittsburgh, Pa.; James B. Clow & Sons, Chicago, Ill.; Molby Boiler Company, New York City; and Goodman Automatic Water Heater, Inc., Brooklyn, N. Y.

# New Trade Publications

METHODS OF CLEANING ATMOSPHERIC AIR is the subject of an interesting article written by A. M. Goodloe, member of the American Society of Heating and Ventilating Engineers, and distributed in pamphlet form by the Midwest Air Filters, Inc., 100 East 45th St., New York. The article covers the quantity and character of atmospheric dust; air-cleaning equipment; tests on air filters; how dust is caught; types of air cleaners; and a general discussion of the subject. A table showing the standard specifications for Midwest air filters also is included.

MOTOCO INDUSTRIAL THERMOMETER, a new product manufactured by the Moto Meter Co., Long Island City, New York, is the subject of a handsome catalog,

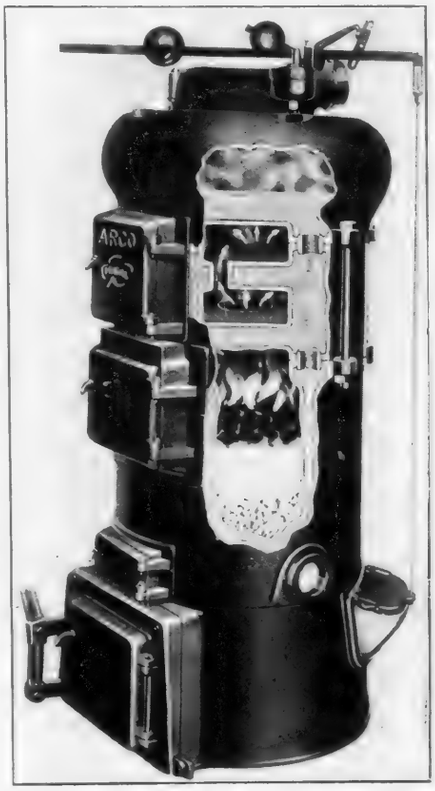
**Motoco Industrial Thermometer**

devoted to the construction and the many uses of this instrument. The catalog is printed in two colors and is profusely illustrated. Copies are available upon request.

STANDARD SPECIFICATIONS FOR AIR FILTERS IN GENERAL VENTILATION, with special reference to the Reed Air Filter, have been published in a folder conforming to the A. I. A. standard file, by the Reed Air Filter Co., Louisville, Ky. It is No. 30D3 and is the second of a series of informative articles on air filters that are being sent out by this company. The folder illustrates different methods of installing the filter in the same air duct to secure increased capacity.

EXCESSIVE FUEL CONSUMPTION is the subject of an interesting folder recently issued by C. A. Dunham Co., 230 East Ohio St., Chicago, Ill. Numerous causes of excessive fuel consumption are enumerated. Incorrect design, improper installation or wrong grade of portions of the piping system require a big fire with constant high steam pressure, it is stated, thus placing the heating system on an uneconomic basis, because the majority of the radiators could easily be heated on a few ounces of steam pressure. This condition can be corrected by required changes in the piping. Another frequent direct cause, the folder points out, is a dirty boiler and piping system. Referring to this cause, the folder states: "These cause not only high fuel consumption but also difficulty in getting heat to circulate satisfactorily in the system. The oil and dirt in the radiators and piping are brought, by and by, into the boiler with the return water. This will retard the steam formation to such an extent that it becomes necessary to fire heavier in order to force the steam through the layer of oil on the surface of the water, thus uselessly increasing the coal consumption. The cure for this condition is a thorough cleaning out of the boiler. Foaming and priming is, in most cases, also the result of a dirty boiler. A third important factor in running up the coal bill unduly is very often found in the chimney, which may not be only of wrong proportions to give proper draft to the boiler, but also poorly constructed, permitting air leakage after it has been used for a while. It it just as wrong to have too large a chimney as it is to have one that is too small. However, the large chimney can be corrected by a good damper control, while the small one will always be a failure."

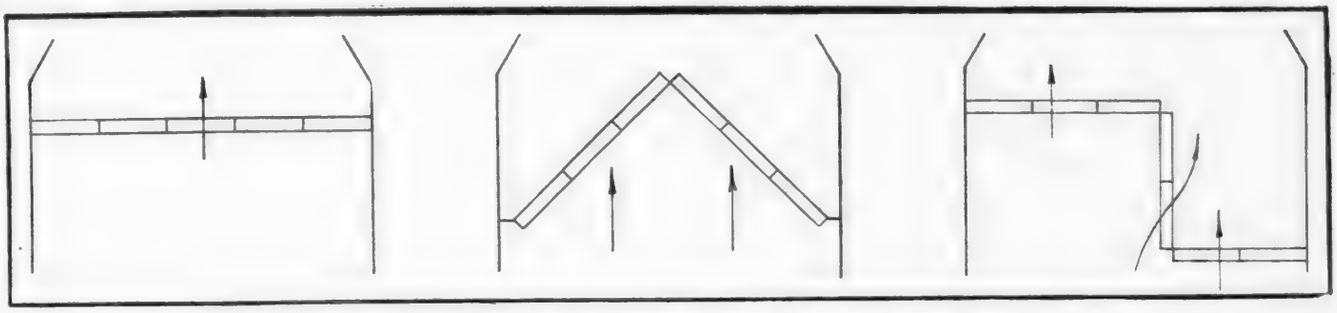
NINETEEN TWENTY FOUR ARCO, featured as the "must popular boiler in America," is the subject of a blanket folder issued by the American Radiator Company, New York and Chicago. The new design provides for greater fuel capacity, greater direct, fire-contact heating surface and greater steam-generating capacity. Among the features of this boiler, which is designed for either steam or water, are mentioned its generous steam dome, the large combustion space above the fire-bed, its unusual steam-generating capacity, the substantial character of its plate work, the use of ground joints for the ash-pit




**Design of 1924 Arco Boiler**

door to eliminate air leakage and to give superior control of combustion with consequent fuel saving, the heavy and rugged shaking mechanism, the use of the improved Arco metallic bellows regulator which operates without chains in front of the boiler as the positive-acting draft control mechanism is in the rear, the staggering of the flue passageways to secure closer contact of the hot gases with the heat-absorbing surfaces, a fire-pot which permits a free and rapid water circulation, Arco grates, strongly trussed at the base, and the fact that the entire base with grate shaker, arms, etc., is shipped assembled in one unit.

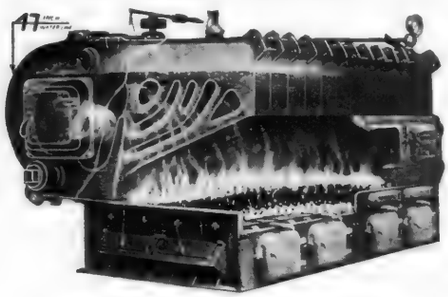
WATER SOFTENING AND FILTRATION, with special reference to the Wayne rapid-rate water softeners and pres-



**Arrangements of Reed Air Filters in Air Duct to Secure Various Capacities**

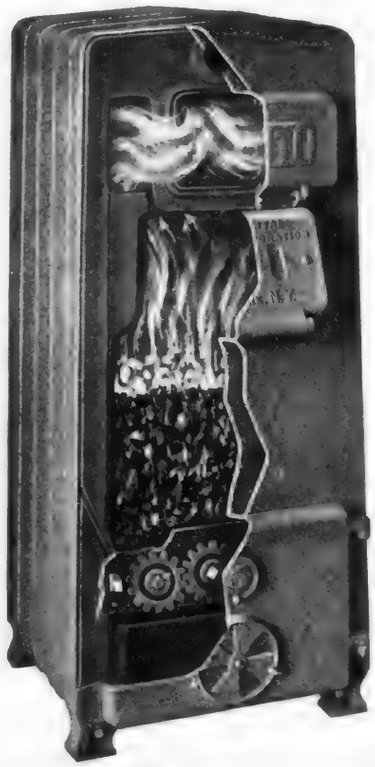
sure filters, are discussed in a catalog received from the Wayne Tank & Pump Co., Fort Wayne, Ind. An interesting account is given of water-softener development, from the slow-acting type of zeolite to the rapid-acting mineral, originally known as Borromite. The different types of water softeners made by the company are then shown in order, including those designed for use in heating and hot water systems; also laundries and similar establishments. The catalogue gives a comprehensive idea of present practice in this field. Size 8¼ x 10½ in. Pp. 32.

CONTINENTAL BOILERS AND RADIATORS, featuring especially the Continental low water-line boiler and the Contento boiler, a development of the company's Continental square sectional boiler, are brought to the attention of the trade in a well-compiled catalogue, issued by the Continental Heater Corporation, Dunkirk, N. Y. The Contento, as will be seen from the accompanying illustration, is of the small boiler type, making possible the installation of efficient water heating systems in homes and other buildings without basements, or where it is desired, for other reasons, to have the



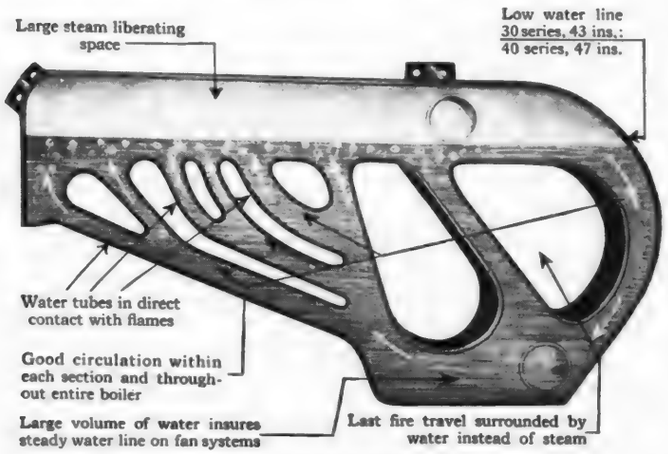
**Construction of Continental Low Water-Line Boiler**

boiler on the same floor as the radiators. It is described as equally efficient, however, for basement installations. The unique design of the Continental low water-line boiler is familiar to heating men. It is fired the short way of the grate, making possible the utilization of all the grate surface. Any portion of the grate which needs shaking or additional fuel



**Fire Travel in Contento Heater**

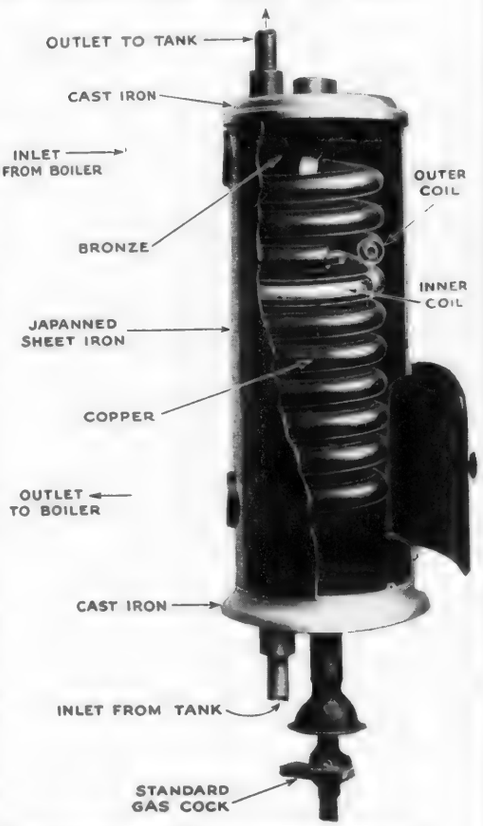
can be attended to without disturbing the balance of the fire. This is made possible by the side-feed feature, the grate bars operating in sections of two of three. Details are included of the low water-line construction in which it is shown that the fire travel, instead of being at the top of the boiler, is at one side where the last fire travel is surrounded by the coldest water. To show how a part of the fire-box may be used in mild weather, a view is included, showing ashes packed on one section of the grate, reducing by that much the area of the fire-box. Although soft coal has long been burned in the Continental low water-line boiler, the company has developed a slight modification of the regular type, in which air retorts are placed between the intermediate sections. These are used to supply heated air over the fire. They form a wall across the entire length of the fire box. Another modification is the double-series boiler, with two separate fire-boxes. The catalogue includes full rating data for each series, together with an impressive list of installations. The company's line of Continental radiators is also shown, the catalogue concluding with directions for installation of each type of boiler. Size 5¼ x 7½ in. Pp. 94.


Large steam liberating space
Low water line
30 series, 43 ins.:
40 series, 47 ins.
Water tubes in direct contact with flames
Good circulation within each section and throughout entire boiler
Large volume of water insures steady water line on fan systems
Last fire travel surrounded by water instead of steam

**Low Water-Line Features of Continental Boiler**

VALVE WORLD, published by the Crane Co., Chicago, Ill., in the May number, features a paper submitted by the company to the Prime Movers Committee of the National Electric Light Association, giving data secured through an extended series of tests in the laboratories and test rooms of Crane Co., on bolting for flange pipe joints. The paper was prepared by L. W. Spring, chief chemist and metallurgist of the Crane Laboratories and R. H. Zinkil, manager of the Testing Division.

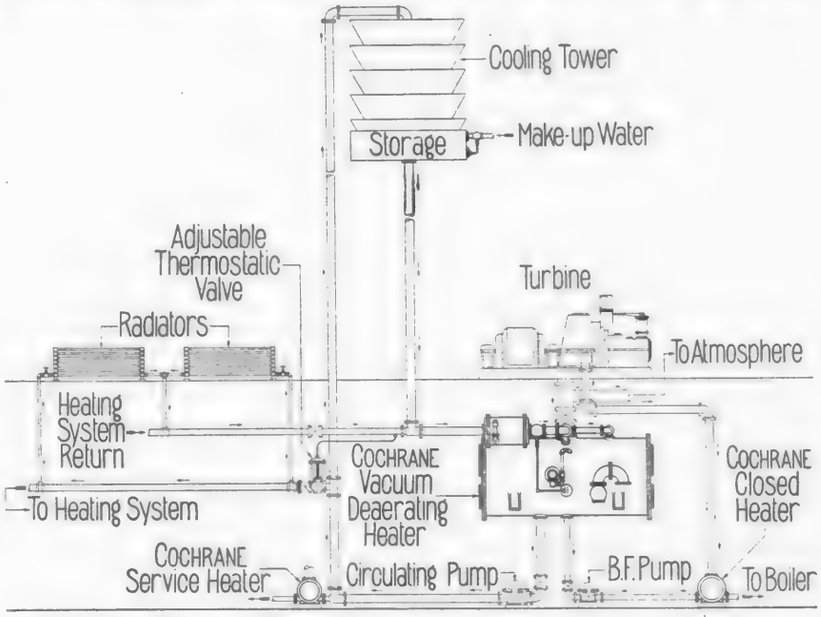
COMPARACOIL, described as the summer and winter domestic water heater is presented in a Folder, in colors, received from the Davis Engineering Corporation, 90 West street, New York. As will be noted from the illustration, this appliance combines with the direct gas heating feature, the well-known Paracoil domestic water heater principle of using hot water from the steam, vapor of water boiler to heat the domestic water supply. In winter




**Construction of Comparacoil Domestic Water Heater**

the hot water from the boiler circulates through an inner coil, thus heating the domestic water supply passing through the outer coil. For summer operation, the gas burner below the outer coil heats the domestic water circulating through it. Both inner and outer coils are of copper and are free from brazing. Baffles are used to add to the efficiency of the gas flame and the shell is also insulated on the outside. Comparacoil is furnished in capacities ranging from 30 to 60 gal. for steam boiler operation, and from 30 to 40 gal. for vapor or water boilers.

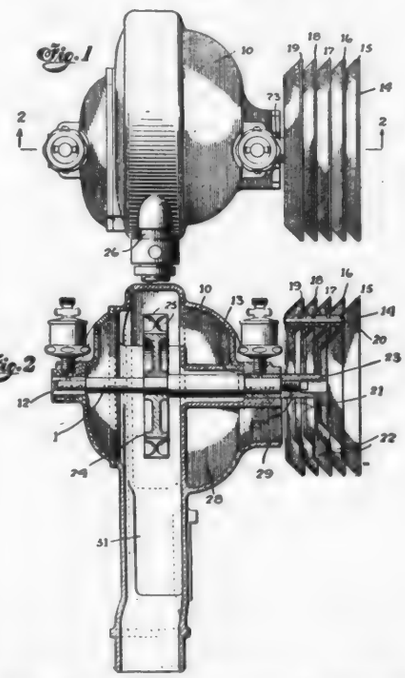
COCHRANE DEAREATING HEATER, designed to protect hot water piping in a heating system, is presented in a circular calling attention to the way in which this appliance meets a long-existing need. As the company points out, due to revolutionary improvements in equipment, central stations are now able to sell current at lower rates than ever before. However, they cannot produce power as cheaply as can an isolated plant which uses steam for heating, drying or process work. The apparatus suitable for such isolated plants has also been greatly improved. For instance, in the water heating system shown herewith, the circulating water from the condenser is distributed through the radiators of the heating system, the temperature being controlled by varying the vacuum. The Cochrane deaerating heater, as here used, serves as a jet condenser for a turbine or engine and, at the same time, serves to protect the piping and radiators, as well as the boilers, against oxygen corrosion. This combination, it is stated, makes it possible to run with a very good vacuum throughout most of the heating season and, with the addition of a cooling tower, throughout the year.




**Water Heating System Utilizing Heat in Circulating Water from Cochrane Deaerating Heater or Condenser**

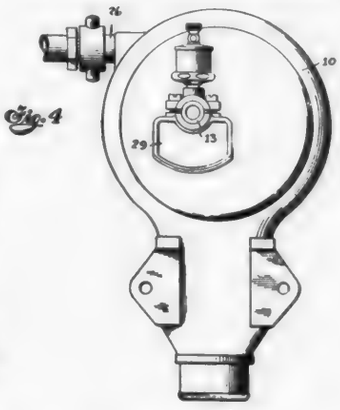
As is well-known, water containing oxygen in solution actively corrodes iron and steel pipes in hot water systems, and the tubes of steel-tube economizers and boilers. The seriousness of such corrosion can be inferred from the large amounts of iron known to be converted into rust in a year by an hourly supply of 1000 lbs. of water containing different amounts of oxygen in solution. The conditions essential to complete removal are stated to be: exposing the water in thin sheets or small drops to an atmosphere in which there is no appreciable partial pressure due to the gases, agitating the water so that all parts are brought repeatedly to the liberating surface, and evaporating some of the water or passing it through and continually removing enough water vapor to sweep away the gases as fast as liberated.

A certain amount of oxygen is driven out of solution by heating water to the boiling point. In order to secure deaeration at lower temperatures than those corresponding to atmospheric pressure, a partial vacuum has to be maintained in the heater corresponding to the pressure of water vapor at the temperature to which the water is heated. This condition will be fulfilled if the concentration of non-condensible gases in the heater is prevented, as by withdrawing a portion of the heater atmosphere continuously by means of an air pump or steam-jet ejector. The Cochrane deaerating heater, it is stated, can also be operated as an ordinary open heater at atmospheric pressure, that is, without the use of ejector and gleaner. A heater of the deaerating design, but without the ejector and gleaner, is recommended by the company for plants where a feed temperature of 212° F. is wanted at first, but where there is a possibility of economizers being added subsequently. When the economizers are installed, it is necessary only to add the remaining parts.




FOXBORO IMPROVED PNEUMATIC-TYPE LONG-DISTANCE LIQUID LEVEL GAUGE, for indicating the heights and volumes of liquids in tanks and reservoirs are featured in Bulletin No. 82-2, issued by the Foxboro Co., Foxboro, Mass. With this instrument the indicating or recording mechanism may be located above or below the point of measurement and at a distance equal to 1000 ft. from the diaphragm box, with accuracy guaranteed.

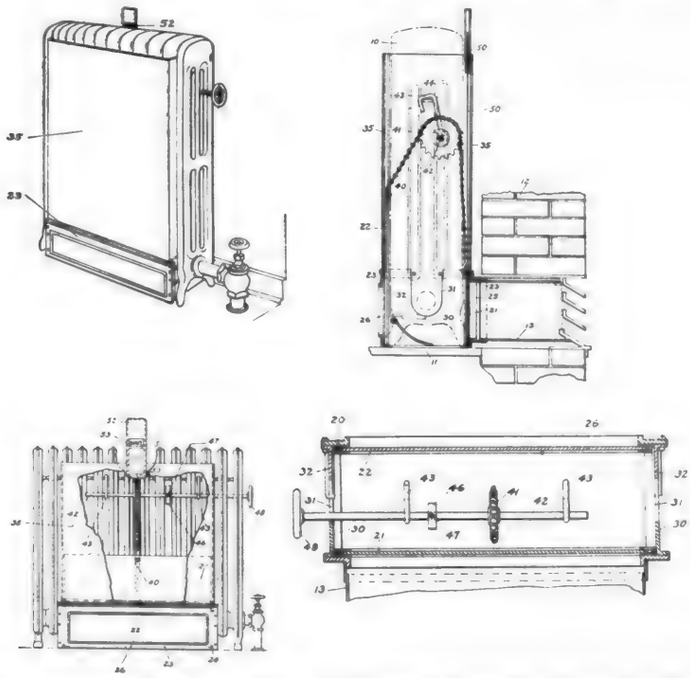
LYNN AIR COOLING AND PURIFYING SYSTEM is described and illustrated in Specification Catalogue No. 17 for architects and engineers, published by the Helmer Air Conditioning Corporation, successors to the Lynn Air Conditioning Co., Inc., 103 Park Avenue, New York. In offering co-operative service to architects and engineers, the announcement is made that the company give sufficient information to enable architects and engineers to write specifications and to include plan and elevation of the air-washing apparatus in the building plans. Data are given covering both the individual units and the complete system. There are also numerous views of typical installations. Special interest attaches




**Design of Lynn and Helmer Revolving Spray Nozzles**

to the Lynn (patented) and Helmer (patents pending) revolving spray nozzles. The accompanying illustration of the spray nozzle shows the spray openings between the plates through which a spray may be thrown 6 ft. in every direction. As nozzles are spaced on about 3-ft. centers, the four sprays from each nozzle cross and make a bank of eight rigid sprays at right angles to the air. The catalogue also shows the Lynn atomizer type of spray head for use especially for humidity supply in textile mills. Size 8½ x 11 in. Pp. 32.

O'HERRON SANITARY DIRECT-INDIRECT RADIATOR VENTILATING BOX, is an interesting device brought out by O'Herron & Co., 29 North Fourth Street, Terre Haute, Ind., and described in newly-issued circular matter. In a letter from the State Board of Health of Indiana, approving the device, particular reference is made to the feature of permitting the front to open in order to clean the interior of the box; also to the adjustment of the dampers in such a way as to permit partial closing or partial opening to adjust the radiator box to outside conditions. Approval is also expressed of the use of a deflector to prevent cold air entering the room when the dampers are partially open. The general construction and operation of the box will be seen from the accompanying illustrations. The heavy metal dampers provided operate in slides and are connected by a chain running over a sprocket. They may be operated by hand from one side of the radiator. The position of the dampers at any time is indicated by a "flag" on the back of the housing. An adjustable collar connection to the wall box is furnished. The standard 8 in. by 30-in. outfit encloses twelve sections of 3-col. 38-in. radiator, with leg 6 in. from the floor to center of tap and, it is stated, gives an absolute free area of 180 sq. in. The box is also made in two larger sizes.



**Construction Features of the O'Herron Direct-Indirect Radiator Ventilating Box**

TYCOS ELECTRIC-CONTACT TEMPERATURE CONTROLS, manufactured by the Taylor Instrument Companies, Rochester, N. Y., are covered in Catalog Part 11850, recently issued. The instrument is designed to accurately maintain temperatures within the limits of 40° F. below zero and 1000° F. above. It may be used in apparatus heated by gas, electricity or steam and is widely applied also for controlling the temperature of brine tanks and of electrically-heated enameling ovens. It is pointed out also that the Tycos instruments meet the requirements of the Underwriters' Laboratories and are included in their re-examination service. They are made in three types: mercury-acuated; vapor-tension-actuated; and gas-actuated. Size 7½ x 10½ in. Pp. 24.

WEATHER VEIN, VOL. 4, No. 2, published by the Carrier Engineering Corporation, Newark, N. J., features the business of the Wm. Wrigley, Jr. Company and the equipment of its chewing-gum factories with "manufactured weather. "The story of the rise of this company, interesting in itself, is made doubly so by the presentation of numerous views of processes connected with the manufacture of chewing gum and of "manufactured weather" in the Chicle dryer and wrapping department, as well as in the coating kettles, where the conditioned air being blown directly into the kettles to accomplish a crisp coating of candy applied to a nugget of chewing gum.

SUPREME HEATER, manufactured by the Supreme Heater Ventilating Corp., St. Louis, Mo., is presented in an attractive catalog recently issued by that company. The Supreme heater comes in both the single unit and multiple-battery types and burns either coal or oil. It may be located on the main floor of a building or in the basement. Quick uniform heating is accomplished, the catalog states, by moving a large volume of air over the heated surfaces of the unit. The air is moved, either by fan pressure or suction, by means of the multi-blade fan which is built into the heater. Size 7 x 10½ in Pp. 8 and cover.

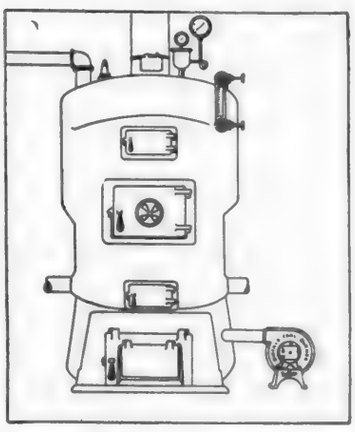
**Supreme Direct-Fired Blower Heater, Single Unit**

COLUMBUS GAS FURNACES are presented in a recent catalog received from The Columbus Heating and Ventilating Co., 425-435 West Town St., Columbus, O. The design of this heater may be seen from the accompanying illustration. Among the construction features are mentioned the fact that the combustion chamber is

**Construction of Columbus Gas Furnace**

made of cast-iron. Air and oxygen are fed directly to the flame. The burners are arranged to bring all of the heat directly in contact with the radiating surface and evenly divided. All other parts of the heater exposed to heat are made of American Ingot iron which has rust-resisting qualities. All joints and seams are spot welded with an electric welder, or doubly seamed to insure tight connections. Separate details are given of the application of thermostatic control and of the Hale gas mixer used on this furnace. One of the interesting illustrations in the catalogue is that of a twin combination coal and gas furnace. Full data are included regarding sizes and capacities. Size 6 x 9 in. Pp. 20.

BUFFALO COAL BURNER, designed to be applied to either a warm-air furnace or a heating boiler for burning the cheapest grades of coal, such as screenings, rice, barley, buckwheat or river coal, has been brought out by the Buffalo Forge Co., Buffalo, N. Y., and is described



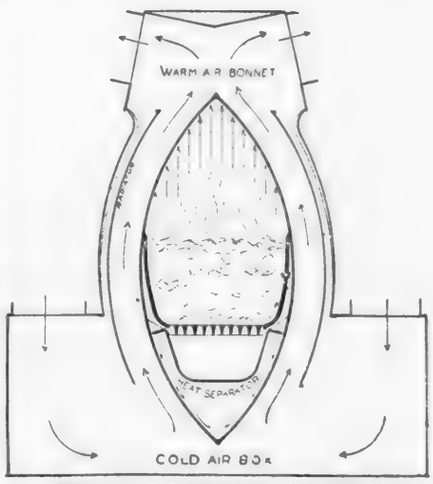
**Buffalo Coal Burner**

and illustrated in newly-issued circular matter. The fan itself has a 5-in. outlet and is equipped with a blast gate provided to regulate the column of air. The motor with which it is equipped is of the slow-speed type, operating at 1750 R. P. M. and is fully enclosed. Motors may be had with this unit either A. C. or D. C. In the directions for installation, the user is advised to set the unit on a pad of felt or cork, and use a short piece of canvas at the outlet opening, instead of an all-metal pipe, to obtain silent operation. Most installations, it is noted, include a thermostat to automatically start and stop the blower and thus maintain an even temperature. The unit is listed at $60.00.

NEW BOILER PRODUCTS are announced in a new catalog issued by the American Radiator Company, Buffalo, N. Y. A copy of the publication has been forwarded to architects and engineers. The new line of Ideal boilers consists of three new boilers and three improved models of previous designs. This includes the Ideal assembled sectional boiler, Ideal Arco round boiler, Ideal Arco sectional boiler, ideal water-tube boiler, Ideal smokeless boiler and the Idea Type "A" heat machine. The Ideal assembled sectional boiler is shipped completely assembled and manufactured in all sizes. It burns all fuels and embodies many features of the company's higher priced boilers. Another new product is the Ideal Arco sectional boiler, designed particularly for moderate-sized homes. It also burns all fuels. A special smoke oxidizer is a new feature of the company's line of smokeless boilers. The new catalog gives complete engineering details, including ratings and capacities and describes each product in detail. The catalog contains 48 pages and is well illustrated.

AEROLOGICAL INSTRUMENTS, for ventilation and air condition test work, is the subject of a series of circulars issued by the E. Vernon Hill Co., 64 West Randolph St., Chicago. The circulars are devoted especially to the Teltru Pitot tube and multiplying manometer, the Psychrobook, the Teltru whirling psychrometer, Hill dust counter, odorometer air sampling apparatus and Healthometers. In the circular devoted to the Teltru Pitot tube and gauge, a detailed description is given of the apparatus itself, together with the necessary arrangements for making a test.

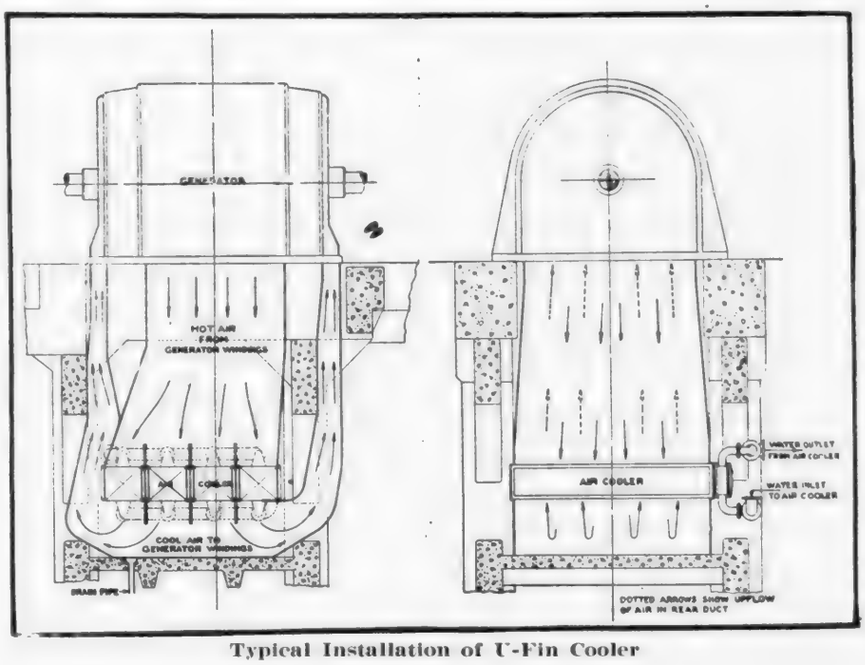
U-FIN COOLER is described in Bulletin No. 1216 issued by the Griscom-Russell Co., New York. The company presents the U-Fin cooler as having a maximum cooling surface in a minimum space. It is of rigid construction and positive in operation. The bulletin describes the product as having several exclusive features including a multipass water head. It is held in a rigidly-braced angle-iron frame, the sides of which are encased in sheet-iron. The cooling surface is formed of rigid U-fin tube elements. Each pair of tubes is embraced by a multiplicity




**Design of Farquhar Warm-Air Furnace**

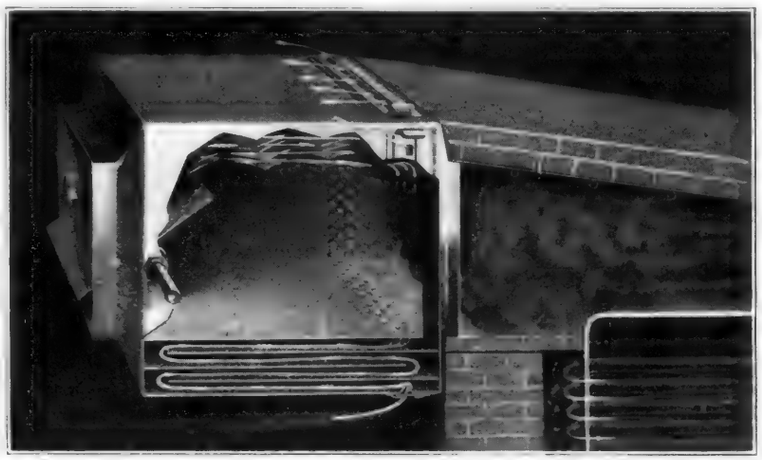
of patented rectangular brass fins pressed on to the tubes by an exclusive process and further secured by dipping into molten tin. The bulletin contains numerous illustrations of the product and its parts and a list of prominent industries which have purchased the U-Fin generator air cooler.

HEALTHFUL HELPFUL HINTS, issued by the Farquhar Furnace Co., Wilmington, O., is an attractive catalog presenting interesting and sound arguments for better heating and ventilation during the winter months. Improper heating, it states, is responsible not only for many so-called winter diseases, but also for serious nervous disorders and breakdowns. The Farquhar furnace, it is urged, is built to prevent "fire poisons" from entering the circulation. The company presents a one-piece, electrically welded, steel fire box, without rivets or seams, to eliminate the danger of the "fire poisons." Another feature urged for this furnace is ease of regulation, the company offering an automatic regulator, which it states, makes it necessary to fire the heater only once in 24 hours in ordinary winter weather. Size 4½ x 9 in. Pp. 16 and cover.

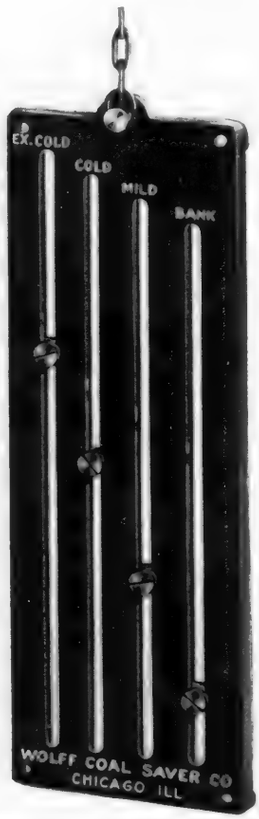



**Typical Installation of U-Fin Cooler**

SAVING FUEL IN 4350 CHICAGO BUILDINGS WITH WOLFF DRAFT CONDITIONERS, is the impressive title of a catalogue devoted to this device, issued by the Wolff Coal Saver Co., 1330–36 West Congress St., Chicago, Ill. and containing numerous photographs of the buildings equipped with these appliances, together with letters testifying to the successful results secured. As explained in the catalogue, the Wolff draft conditioner is intended to be installed in the breeching, or smoke pipe, as near to the boiler as possible. It operates by admitting fresh air into the draft conditioner through a series of slots or holes, the size of which can be regulated. This fresh air passes up and over the baffle walls, on the inside of the draft conditioner, where it is heated before entering the business part of the device. The hot air in the draft conditioner, it is stated, forms an air cushion which holds the hot boiler gases in the boiler until practically all of the heat is extracted from them. The Wolff regulator plate, which is a part of the complete arrangement, is intended to be attached to the front of the boiler, or to the wall of the boiler-room.



**Construction of Wolff Draft Conditioner or Coal Saver**

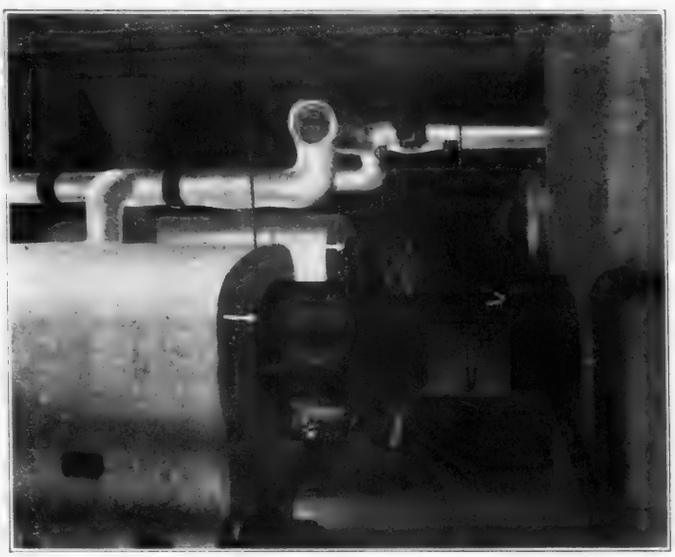



**Wolff Draft Regulator Plate**

It is connected by steel chains to the draft-regulating damper in the draft conditioner.

On zero days the ring is hooked to the bottom of the plate marked "extra cold." When the ring is on the hook marked "mild" it acts to keep the boiler pressure down to 2 or 3 lbs. (or less if desired). With the hook on "bank," as during the night, a vapor is retained in the boiler making it easy to get up steam in the morning.

The manufacturers point out that the Wolff draft conditioner can be installed on boilers or furnaces of any type or make. The company offers a guarantee that these appliances will save not less than 15% of the fuel ordinarily burned. Size 8½ x 11 in. Pp. 32.



**Wolff Draft Conditioner Installed on Two Utica Imperial Super-Smokeless Boilers**

KORFUND FOUNDATION PLATES OR INSULATION SYSTEMS are described in a brief pamphlet issued by the Korfund Co., insulating specialists, New York. Attention is called to the importance of a proper foundation and insulation of all machinery from surrounding property to prevent undue vibration and lessen the noise. The Korfund plates consist of strips or blocks of cork specially selected, treated according to the Korfund methods and bound together to plates of standard size by an iron framework, reinforced by internal iron struts. It is claimed that use of the Korfund foundation plates not only preserves the surrounding buildings from deterioration by shock but that the life of the machinery, itself, also is considerably lengthened.

TWINDOLOX, described as a window lock that is automatic — "jimmy-proof" — forget-proof and easily operated, is presented in a folder issued by the Mills-Penfield Corporation, New York. No change in existing window construction is necessary in attaching this device, it is stated, and windows may be locked and held in any position.

FOXBORO BULLETIN 96-1, the second general catalog issued by the Foxboro Co., Inc., Foxboro, Mass., is an attractive booklet of 24 pages and cover, presenting briefly the many different types of indicating, recording and controlling instruments manufactured under the Foxboro trade-mark. Three advantages of the company's Improved Triplex gauges are set forth as: (1) it occupies little space, being in a neat, round-form, dust- and moisture-proof case; (2) it has long open scales, flat pointers and dials which can be read easily with no possibility of parallax, at a distance of 15 ft.; (3) the action of the pointers is positively "dead-beat" and the company guarantees its permanent accuracy. More than a score of the Foxboro instruments are described and illustrated.

ENGINEERS TOO TIMID AND TOO MODEST is the title of an article broadcasted in circular form by the Jesse Coogan Engineering Co., Salt Lake City, Utah, calling attention to the fact that it was taken from THE HEATING AND VENTILATING MAGAZINE. Accompanying the circular are some interesting data comparing water heating and vacuum steam heating results in the Eagle Gate and Craig Apartments, in Salt Lake City, favoring the Coogan system of water heating.

# Market of Changing Moods

## Business Suffers From Attack of Nerves—No Cause for Alarm in Present Situation

Especially Prepared for THE HEATING AND VENTILATING MAGAZINE

*By L. W. Alwyn-Schmidt*

THE CONDITION of the national markets, which appeared healthy enough all through Spring, has suddenly taken a turn for the worse. We cautioned against expansion early this year. This we must do again now but wish to emphasize also the need for an optimistic view of the situation. It is not at all so unfavorable as it has been made to appear. There have been all along signs of weakness. But this weakness is not one of structure. It results principally from a combination of outward influences, such as the weather, economic conditions abroad and the national political situation. None is dependent upon the action of the broad economic principles which finally will govern the course of our market.

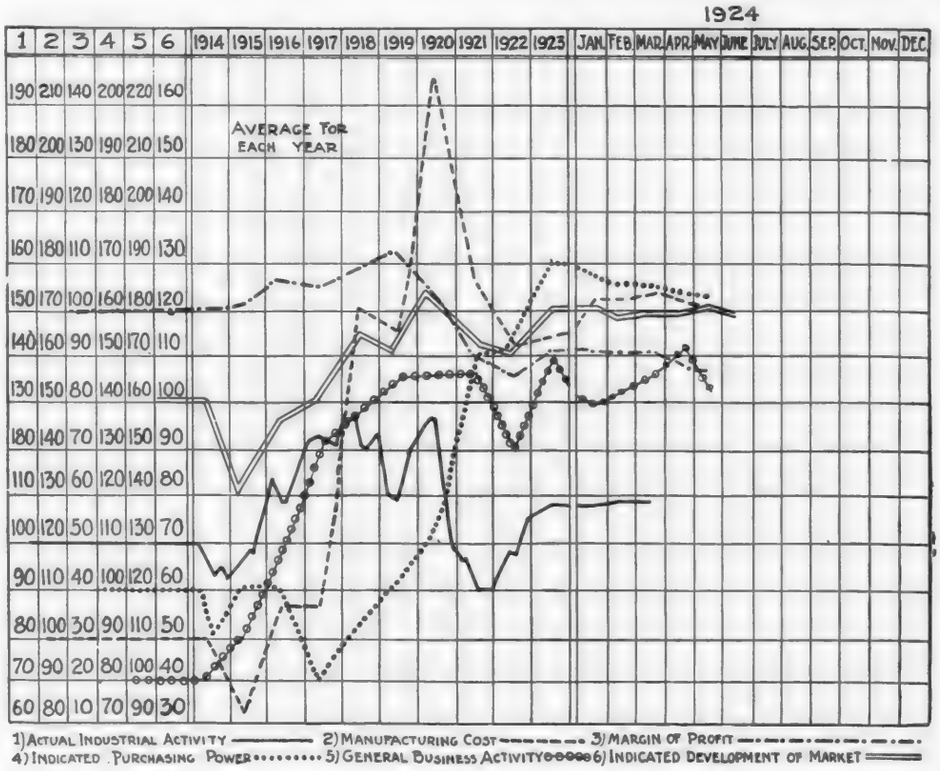
There is, in fact, reason to assume that the present condition of the market is mostly one of personal attitude. Business suffers from a severe attack of nerves, caused, in part, by the delayed recovery of the market predicted so definitely with the coming of the New Year. Let us look into this more thoroughly.

Is there apparent an inherent weakness in the condition of the national industry? Employment figures have shown decline during the last months against the comparatively high levels of last year. Employment, in fact, seems to have decreased at the rate of 5% on the showing of the still incomplete reports. The steel industry reports a slackening in orders. Glass ware, the textile industry and the rug makers report reductions and the decline seems to run practically through the whole line of industrial activity. But while a reduction in the employment figures may mean a decline in industrial activity, it does not essentially indicate a fundamental weakening of the industrial structure. This is particularly the case if there has not been any preceding industrial expansion. We have had no over production. Also, the present limitation of production is accompanied almost everywhere by a corresponding lower adjustment of production cost.

Prices for industrial products are on a downward grade. But the downward movement proceeds sufficiently leisurely as not to disorganize the earning power of the industry. The profit margin has remained comparatively steady. It is somewhat less than last month, but higher than, for instance, during 1922. The industrial producer, therefore, is not in a rout. His action is rather one of watchful waiting for further developments. These developments will be governed principally by the future movement of the national purchasing power.

National purchasing power has been high during the last half year of 1923. It is now declining. The decline is caused (1) by the slow depletion of the purchasing reserve, (2) by the reduction in the number of employed wage earners, (3) by the reduction of individual earnings. It is counteracted by the ability of the producing industry to take smaller profits and by the resulting decline of prices. Following the action of these co-operating factors there has existed, all along, a peculiar but satisfying balance of forces, leaving the purchasing power of the nation approximately the same since February. It stands, however, below the scale of the second half of last year.

The question is now, "Is the present scale low or was that of last year exceptionally high?" Comparison with the figures of former years emphatically points to the second eventuality. It leads us to believe that the present level must be regarded as normal,


1924
1 2 3 4 5 6
1914 1915 1916 1917 1918 1919 1920 1921 1922 1923
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEP. OCT. NOV. DEC.
AVERAGE FOR EACH YEAR
1) ACTUAL INDUSTRIAL ACTIVITY
2) MANUFACTURING COST
3) MARGIN OF PROFIT
4) INDICATED PURCHASING POWER
5) GENERAL BUSINESS ACTIVITY
6) INDICATED DEVELOPMENT OF MARKET

Analysis of Business Conditions at End of May

while that of last year was abnormal in character.

It stands to reason that if the industry is not losing money but operates with reasonable profits, and if, at the same time, the national purchasing power continues to move upon a normal level, business cannot be so bad as it is painted. The fact is that matters would be comparatively good in all retail markets if only the weather had been more favorable. As it is, the weather played havoc with the retail business. It did more to upset calculations than any other factor involved in producing the present situation.

But even the weather could not continue unfavorable all the time. The turn had to come and with it has come a renewed confidence in the carrying ability of the market.

Ours is at the best a market of changing moods, and the fact that we are at the threshold of a presidential campaign, with all the uncertainty of this event for the future of business, by no means improves matters. So business men prefer to move cautiously. They are well advised to do so because their caution will assist the recovery of the market when once it has arrived.

In the meantime it behooves everybody to keep cool. Those who have acted conservatively during January and February have no cause for worry. Nothing has happened to change their opinion of the stability and general healthy aspect of the market. As pointed out, the conditions depressing the market are largely artificial. They will remove themselves in a very short time. We can not always have prosperity, but even the present lower levels of market activity are far in excess of such normalcy as we were accustomed before the war.

There is no cause for a panic. All that is required is a sane attitude and a level mind in dealing with all and every aspect of the situation. Especially do not let us forget that the present time of the year invariably is accompanied by a temporary slackening of all industrial activity.

## Movement to Standardize Cast-Iron Pipe and Fittings

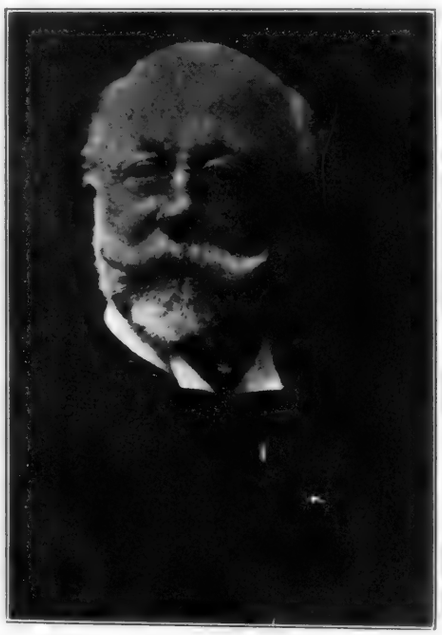
In furtherance of the movement to standardize the specifications for cast-iron pipe and special castings, a conference was held June 5, at the Engineering Societies Building, New York, under the auspices of the American Engineering Standards Committee. The principal business at the conference was to consider the report of a committee appointed to consider the requests of the American Gas Association and the American Society for Testing Materials for the approval, by the A. E. S. C., of their respective specifications for cast-iron pipe and special castings. The conference was held too late for a report of its proceedings to be published in this issue.

## Death of William J. Baldwin

Ripe in years and enjoying the honors that came to him as the result of his many notable engineering achievements; William J. Baldwin, dean of the heating and ventilating profession in America, has passed on to his reward. He was taken suddenly ill while walking along a Brooklyn business street, May 7. Before an ambulance could be summoned he died and his body was taken to his home at 151 Halsey Street, Brooklyn.

Mr. Baldwin was 79 years old. He was born in Ireland, and came to this country when a young man. He commenced his engineering career at East Boston as a naval constructor.

An extended sketch of Mr. Baldwin's career appeared in THE HEATING AND VENTILATING MAGAZINE as late as last April. Even since the late '60's he has been identified with the heating and ventilating profession, being one of the first to use the fractional method of heating, in the building of the Manhattan Company and in the Merchants' Bank Building, erected about 1882.



The Late William J. Baldwin

Outside of his extensive practice in the heating and ventilation of an imposing number of buildings, from the United States Immigration Station, at Ellis Island, New York, to the Lackawanna Railroad Terminal, in Hoboken, N. J., Mr. Baldwin was also the consulting engineer for the ventilation of the telephone and electric conduit subways for the Empire City Subway Company, in New York.

He was the author of numerous books on heating subjects, his best known work being "Baldwin on Heating," now in its nineteenth edition. He was an honorary member of the American Society of Heating and Ventilating Engineers, and was a member of the A. S. M. E. and the A. S. C. E.

Mr. Baldwin is survived by his widow and six children, three sons and three daughters—William J., Jr., John R. and Thomas B. Baldwin and Mrs. Anna Harrington, Mrs. Rose Crosby and Mrs. Josephine Mayer.

## Deaths

A sketch of the career of R. V. Stureman, of Springfield, a well-known central station heating engineer, who, with his wife, her father and mother, met death in the wreck of the Twentieth Century Limited, December 9, 1923, is contained in the current issue of the *Bulletin* of the National District Heating Association. Mr. Stureman began his business career with the Central Illinois Light Company in the Spring of 1911. In 1915 he became superintendent of the heating department of the Springfield Gas & Electric Company. Two years later the duties of assistant manager were added to his work.

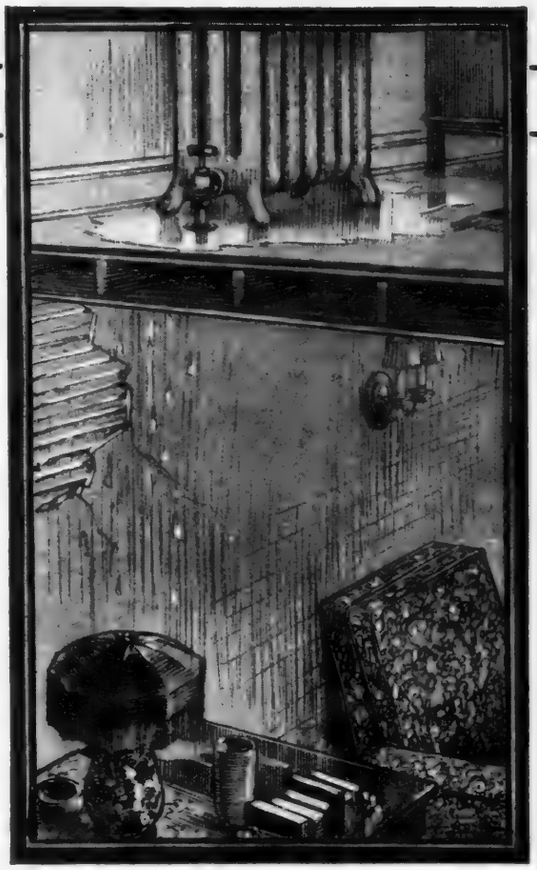
During the war he served in the Quartermaster Corps, first at Camp Logan, Houston, Texas, and, later, at Camp Grant, Rockford, Ill., where he had charge of the heating work. He attained the rank of captain in the service.

After the war he returned to Springfield where he took up his former duties. A year later he entered the heating contracting business in Springfield and was engaged in this business at the time of his death. Among his recent contracts was one for rebuilding practically the entire underground distribution system of the Illinois Power Company, in Springfield. He was 31 years old.

## As Others See Us

"On this subject (heating and ventilation)" writes "Woolgatherer, in *The Florists Exchange*, "I will say that since I have perused THE HEATING AND VENTILATING MAGAZINE I have learned not a few things. This monthly journal does not, of course, deal with greenhouse matters, but heating is heating, and the principles that govern boilers for domestic and factory purposes, more or less operate with greenhouse heating. The magazine referred to draws its contributions from experts, while the advertisements are intensely interesting, especially the illustrations which show the inside and outside of things. The florist who is interested in his business can, I imagine, learn not a little from such a journal. The October issue for instance, discussed when it pays to burn oil and the efficiency of the oil flame. Another article that seemed logical dealt with the fact that gas, oil, candles, etc. derive their flame from the reservoir below the burner; with coal, we burn it upside down, piling on the fuel from the top. Another article on radiating values of colors seems to bear out the view expressed by Mr. Giblin of boiler fame, at a florists' meeting a year or so ago.

A Sales Argument for the Heating Contractor



# The cost of one unnecessary leak would put SUPER-PACKLESS throughout the home

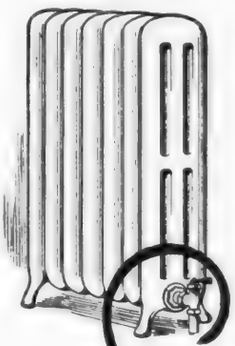
THE heating contractor who advises his customer to use only the most modern and efficient valves for a new steam or hot water system is sometimes asked the question—"what do they cost?"

In the case of SUPER-PACKLESS Valves—he tells the customer that they *save* several times their cost. He paints a picture of the old-style valve with its short-lived packing, dripping a puddle on the hardwood floor—and the water soaking through to the ceiling below. *One such unnecessary leak* would cost more than the valves were worth.

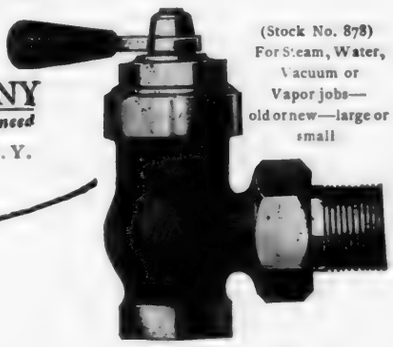
He tells how old-style valves have to be repacked regularly—a continual and annoying expense for upkeep.

He tells how energy is saved and backaches prevented—by the *quick turning* feature of SUPER-PACKLESS.

Telling **home-builders** about this *heating refinement* **brings** more business to the **heating contractor.**



## SUPER-PACKLESS Radiator Valves



(Stock No. 878) For Steam, Water, Vacuum or Vapor jobs—old or new—large or small

This bid provides for Ideal Super-Packless Valves on all radiators We can reduce the price of this estimate $ if we install ordinary packed valves instead of Ideal Super-Packless Valves.

—and put this sticker on every bid

AMERICAN RADIATOR COMPANY
IDEAL Boilers and AMERICAN Radiators for every heating need
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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

# VAPOR HEATING

## Hoffman Controlled Heat

Hoffman Controlled Heat is designed to circulate steam at any pressure above atmospheric, to return the water of condensation to the boiler by gravity, and to give positive steam control to each radiator. Fig. 1 shows a typical piping arrangement and the application of Hoffman equipment.

The steam and dry-return mains start high at the boiler and grade down, in direction of arrows, to a point where they are dripped into a wet return, which carries the water of condensation back to the boiler. The ends of the supply mains are vented of air into the dry return, through a No. 8 Hoffman return-line valve, so as to keep steam in all parts of the system, even though the radiators are turned off.

The Hoffman pressure-gauge is of the mercury type, with magnifying reading glass, connected to the steam space of the boiler, so that the boiler pressure can be accurately determined in ounces (Fig. 2).

The Hoffman damper regulator has a 12-in. rubber diaphragm and is connected to

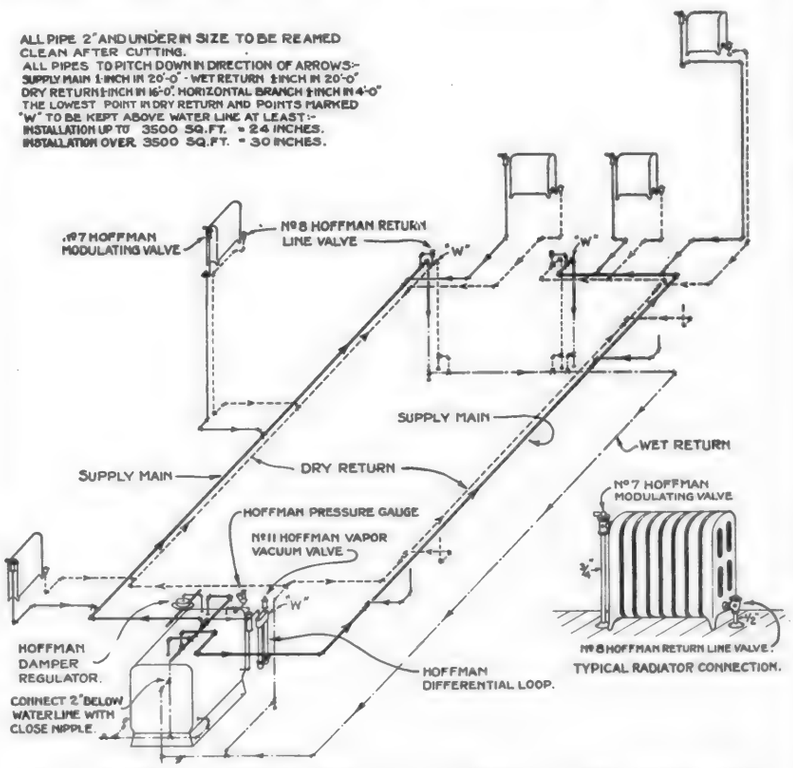
ALL PIPE 2" AND UNDER IN SIZE TO BE REAMED CLEAN AFTER CUTTING.
ALL PIPES TO PITCH DOWN IN DIRECTION OF ARROWS:-
SUPPLY MAIN 1-INCH IN 20'-0" - WET RETURN 1-INCH IN 20'-0"
DRY RETURN 1-INCH IN 16'-0" HORIZONTAL BRANCH 1-INCH IN 4'-0"
THE LOWEST POINT IN DRY RETURN AND POINTS MARKED "W" TO BE KEPT ABOVE WATER LINE AT LEAST:-
INSTALLATION UP TO 3500 SQ.FT. = 24 INCHES.
INSTALLATION OVER 3500 SQ.FT. = 30 INCHES.
No 7 HOFFMAN MODULATING VALVE
No 8 HOFFMAN RETURN LINE VALVE
"W"
SUPPLY MAIN
WET RETURN
SUPPLY MAIN
DRY RETURN
No 7 HOFFMAN MODULATING VALVE
HOFFMAN PRESSURE GAUGE
No 11 HOFFMAN VAPOR VACUUM VALVE
HOFFMAN DAMPER REGULATOR.
CONNECT 2" BELOW WATER LINE WITH CLOSE NIPPLE.
HOFFMAN DIFFERENTIAL LOOP.
No 8 HOFFMAN RETURN LINE VALVE.
TYPICAL RADIATOR CONNECTION.

FIG. 1—TYPICAL INSTALLATION OF HOFFMAN CONTROLLED HEAT

the steam space of the boiler, also to all dampers. Care has been taken to make it extremely sensitive.

The Hoffman differential loop is a non-mechanical device, designed to maintain a constant pressure differential between the supply and return pipes, and is usually installed near the boiler. Fig. 3 shows points of connection as follows:

A—To No. 11 Hoffman vapor-vacuum valve.
B—To steam space of boiler.
*C—To high end of dry-return main.
(*)—Important: At least 24 in. above water-line of boiler.

The operation of the Hoffman differential loop is illustrated in Fig. 4.

By its operation water is permitted to rise in the vertical return mains to a predetermined height, when the loop functions, blowing over a small quantity of steam

*(Continued on Data Sheet No. 132-VV)*



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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

# VAPOR HEATING

## Hoffman Controlled Heat

*(Continued from Data Sheet No. 132-UU)*

through internal tube "E". This closes the venting port of the Hoffman valve installed on the loop for venting the system. The air is then compressed, building up a pressure and preventing further rise of water in the vertical part of the return above the predetermined height.

As soon as this is accomplished, and the action is found to be almost instantaneous, the loop reseals, and no more steam is blown over until the differential pressure is no longer maintained. By the alternate blowing over and resealing of the loop, constant differential pressure may be maintained between the steam and return mains.

By the maintenance of this differential, regardless of how high the boiler pressure goes, circulation will take place in a radiator when turned on, with the return-main vent closed through the loop.

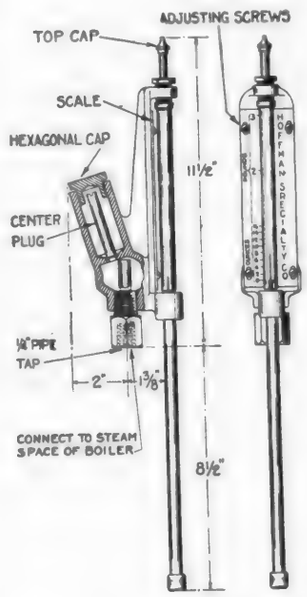


FIG. 2—HOFFMAN PRESSURE GAUGE

The No. 11 Hoffman vapor-vacuum valve, shown in Fig. 5, is connected to the top of the differential loop to permit the removal of air from and prevent the return of air to the system. Its vent port is normally closed, but as soon as a slight pressure is exerted the vacuum check is lifted from its seat and allows the air from the system to vent freely. When the pressure drops, the valve check reseals and the vent port closes, preventing the intake of air.

When the fire is banked and generation of steam slows down, or ceases entirely, condensation of steam continues in the radiators, but by preventing the return of air to the system a vacuum forms, and with an increase in vacuum, a cor-

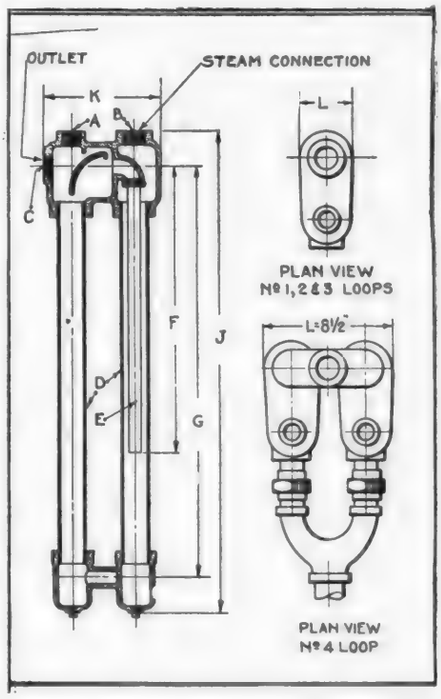


FIG. 3—HOFFMAN DIFFERENTIAL LOOP

DIMENSIONS & CAPACITIES OF LOOPS

| LOOP NO. | A | B | C | D | E | F | G | J | K | L | CAPACITY SQ. FT. RAD. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ¾" | 1¼ | 1¼ | 1½ | ½" | 18¼ | 26 | 30⅝ | 7⅝ | 3" | 2000 |
| 2 | ¾ | 1¼ | 1¼ | 1½ | ¾ | 18¼ | 26 | 30⅝ | 7⅝ | 3 | 3500 |
| 3 | ¾ | 1½ | 1½ | 2 | 1 | 25 | 32 | 37¾ | 10 | 3¾ | 7500 |
| 4 | ¾ | 2 | 2 | 2 | 1 | 25 | 32 | 37¾ | 10 | 8½ | 15000 |

*(Continued on Data Sheet No. 132-WW)*



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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

## VAPOR HEATING

### Hoffman Controlled Heat

*(Continued from Data Sheet No. 132-VV)*

responding decrease in the vaporizing temperature of the water takes place. Thus approximately with a 5-in. vacuum, vapor will be given off at a temperature of 201° F.; with a 10-in. vacuum, at 190° F.; and with a 15-in. vacuum, at 176° F.

Thus vapor will be delivered to the radiators for a long period when the fire is banked or dampers closed; also when the fire is brightened the response at the radiators will take place quickly, because of the low vaporizing point of the water under vacuum conditions.

The No. 7 Hoffman adjustable modulating valve, shown in Fig. 6, is only made in ¾-in. size and is rated for radiators up to 200 sq. ft. in capacity. It is used with either steam or water-type radiators, and is usually connected at the top tapping of water-type radiators, and bottom tapping of steam-type radiators. Its chief feature is what is described as the easy and accurate method of adjusting its valve port for various-sized radiators.

On the valve bonnet there are two dial plates, the lower rigidly fixed to the bonnet and marked with twenty graduations, each of which represents a port area equivalent to 10 sq. ft. of radiation.

To adjust the valve for the radiator requirements it is necessary to loosen the lock nut and turn the valve handle, which likewise turns the top dial plate and rotary sleeve. This varies the port area in accordance with dial graduations. Thus, with twenty graduations visible, the port area is sufficient for 200 sq. ft. radiator; with fifteen graduations, for 150 sq. ft. etc.

The valve is made with lever and wood wheel handles, and of lock-shield, closed-top, extended-stem, or chain-pull pattern.

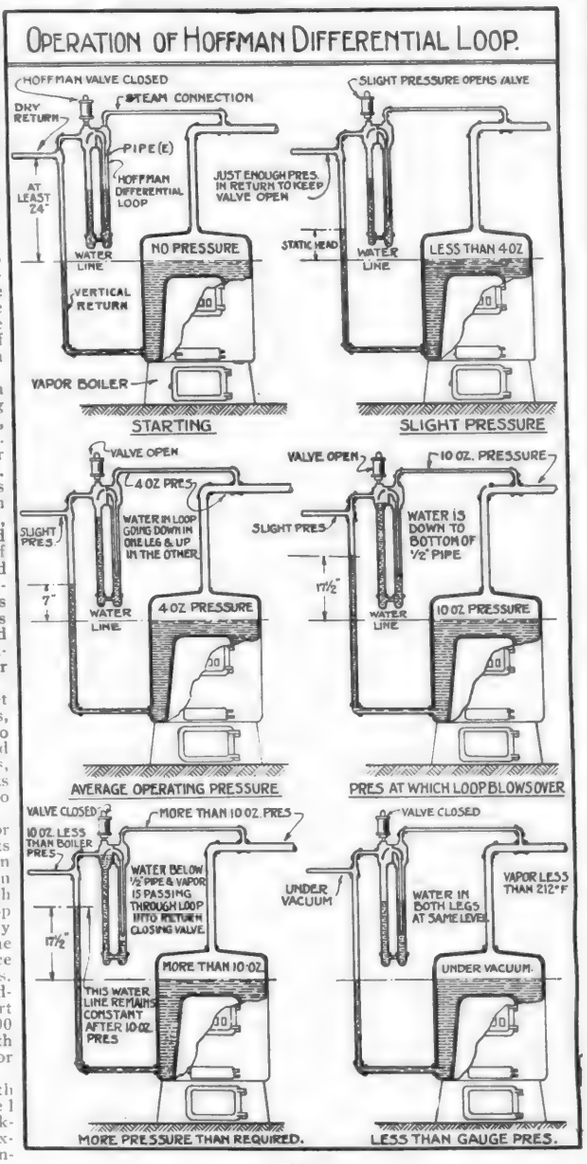


Fig. 4

*(Continued on Data Sheet No. 132-XX)*



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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

## VAPOR HEATING

### Hoffman Controlled Heat

*(Continued from Data Sheet No. 132-WW)*

The No. 8 Hoffman return-line valve (Fig. 7) is used at the return end of each radiator to permit the air and water of condensation to freely pass into the return piping and to stop steam leaving the radiator. It is also used at the end of steam mains to vent the air from same into the dry return. It is designed to operate consistently under a pressure range from 13 in. of vacuum to 50 lbs. steam pressure. Water at a temperature of approximately 12° less than the temperature corresponding to the steam pressure, it is stated, causes full valve opening and free discharge of condensation.

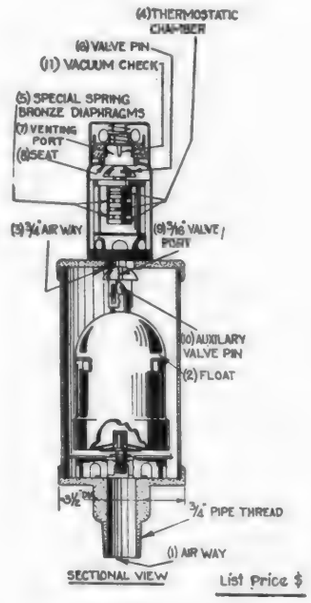


FIG. 5—NO. 11 HOFFMAN VAPOR-VACUUM VALVE

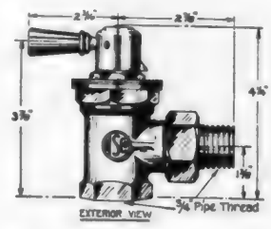


FIG. 6—NO. 7 HOFFMAN ADJUSTABLE MODULATING VALVE

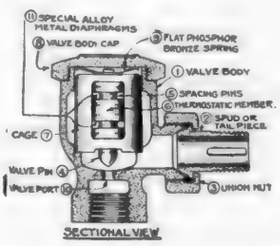


FIG. 7—NO. 8 HOFFMAN RETURN-LINE VALVE

The thermostatic member is removable and may be changed from one valve to another of the same size without adjustment.

The No. 8 valve has ½-in. pipe connections, ¼-in. port, and is furnished in angle, straightway, right and left-hand offset patterns. The normal capacity is 200 sq. ft. of cast-iron radiation.

The No. 9 Hoffman return-line valve is constructed and operated the same as the No. 8 valve, but is ¾-in. in size, and has a rated capacity of 600 sq. ft. It is only made in angle pattern, and has a 5/16in. port, for pressures up to 15 lbs., and 3/16 in. port for higher pressures.

Tables 1 to 6 give the necessary information for sizing pipes for Hoffman Controlled Heat.

*(Continued on Data Sheet No. 132-YY)*

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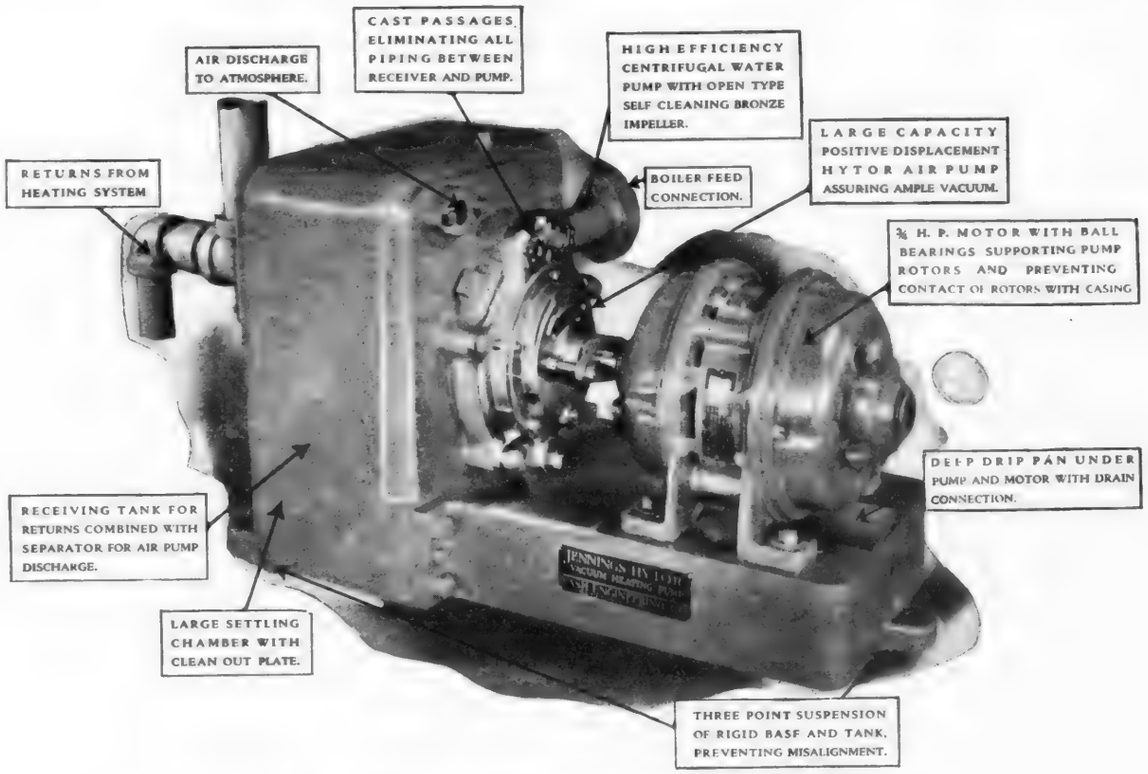
CAST PASSAGES ELIMINATING ALL PIPING BETWEEN RECEIVER AND PUMP.
AIR DISCHARGE TO ATMOSPHERE.
HIGH EFFICIENCY CENTRIFUGAL WATER PUMP WITH OPEN TYPE SELF CLEANING BRONZE IMPELLER.
LARGE CAPACITY POSITIVE DISPLACEMENT HYTOR AIR PUMP ASSURING AMPLE VACUUM.
RETURNS FROM HEATING SYSTEM
BOILER FEED CONNECTION.
¾ H. P. MOTOR WITH BALL BEARINGS SUPPORTING PUMP ROTORS AND PREVENTING CONTACT OF ROTORS WITH CASING
DEEP DRIP PAN UNDER PUMP AND MOTOR WITH DRAIN CONNECTION.
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LARGE SETTLING CHAMBER WITH CLEAN OUT PLATE.
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# Trade and Miscellaneous Notes

## Coming Events

**June 16–20.**—Annual convention of the National Association of Sheet Metal Contractors, in Washington, D. C.

**June 24–26, 1924**—Forty-second annual convention of the National Association of Master Plumbers, in West Baden, Ind. Headquarters at the West Baden Springs Hotel.

## Miscellaneous Notes

**April Building Construction** figures, as compiled by the F. W. Dodge Corporation, confirmed the impression of gradual decline gained from the March statistics. Contracts awarded in 36 eastern States, comprising about seven-eighths of the total construction of the country totaled $480,097,300, an 11% increase over March and 19% increase over April of last year. Only two sections, New York and northern New Jersey, and the southeastern States, showed material gains, however. Total construction started from January 1 to May 1 reached the unprecedented total of $1,514,968,200. In New York City alone the gain was 115%.

**Carnegie Institute of Technology,** Pittsburgh, Pa., announces that a large majority of the regular faculty will be retained for the summer school which opens June 16 and ends August 8. A variety of courses in heating and ventilation and plumbing will be offered.

**Cedar Rapids, Ia.**—Cedar Rapids members of the National Association of Stationary Engineers, at a recent meeting, heard an address on "Building Heating" by Charles E. Chapman, chief engineer of the Roosevelt school in Cedar Rapids.

**Illinois Power & Light Corporation,** Chicago, Ill., has acquired the property of the Central Illinois Electric Co.

**Permanent Industrial Exposition,** Newark, N. J. has added a comprehensive exhibit of building materials, equipment and devices for homs. This new feature of Newark is designed to make an especial appeal to world's buyers who visit the Metropolitan district annually.

**Trade Information Bulletins** of the Department of Commerce no longer will be mailed automatically to firms which have expressed a desire to receive them. Instead the Department is now forwarding lists of new publications as they become available with a statement that a copy of each will be mailed free upon request.

**Milwaukee Graphic Arts Exposition,** to be held in Milwaukee, Wis., August 18 to 23, will present a novel exhibit in the shape of a demonstration that present day craftsman in the printing trades can turn out effective jobs with old-time facilities. The idea resulted from a discussion of the apprenticeship problem, numerous business men arguing that modern craftsmen are not the equal of those of bygone days.

**Board of Trade for German-American Commerce, Inc.,** has been formed to re-establish and further commercial relations between the United States and Germany. Headquarters have been opened in Suite 507, 60 Broadway, New York City, and plans are underway to open branches throughout the United States. Jarvis W. Mason is president of the organization. Other officers are: Eugene Hennigan, vice president; C. F. Koth, treasurer; Henry C. Steneck, assistant treasurer; and Robert C. Mayer, secretary. H. Portack is executive secretary.

**National Industrial Conference Board,** after a country-wide survey, finds that the nation's rent bill has continued to rise since the first of the year. In the four months ending March 15 the rise was 3%; in the past 10 years it was 85%. In New York the increase for the four-month period was less

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than 10%. Other important cities showing increases are Boston, Newark, N. J., Pittsburgh, Pa., Rochester and Syracuse, N. Y. Chester, Pa., led the procession with a boost during the four months of from 21 to 30%.

**Southwestern Trade Golf Association**, formed to promote good-fellowship and interest in the heating, ventilating and sanitary engineering industries in the Southwest, was organized in Kansas City, May 2, at the Hillcrest Country Club, by the election of the following officers: President, J. C. McDonald, manager of the Kansas City branch of the United States Radiator Corporation; vice-president, Carl R. Smith, Magill Plumbing Co., secretary-treasurer, George E. Foley, Foley Plumbing & Heating Co.; and captain, R. M. Ousterhout, W. B. Young Supply Co. Board of governors: R. L. Dawson, R. L. Dawson Construction Co.; E. H. Graham, Crane Co.; and E. C. Harbordt, purchasing agent, U. S. Water and Steam Supply Co.

**American Decimal System** of weights and measures is proposed by a bill introduced recently in the United States Senate by Senator William H. King. The proposed law would rectify, coordinate and decimalize the weights and measures of the United States by providing that the foot shall be the linear base for weights and measures, the ounce being defined as the weight of the cube of the tenth of the foot of water at the maximum density, and the fluid ounce as the volume of the cube of the tenth of a foot.

**Simplified Practice Recommendations** have been put into effect in numerous industries including manufacturers of range boilers, hollow building tile, files and rasps, forged tools, and half a dozen others, R. M. Anderson, Division of Simplified Practice of the Department of Commerce announces. The variety of range boilers has been reduced from 130 to 13 and hollow building tile from 36 to 19. Conferences looking to these changes were held March 11 to March 14, 1924 at the Commerce Building in Washington.

**National Trade Extension Bureau**, at a recent meeting of the board of directors at Evansville, Ind., approved the bureau's 1924 budget which provided for expenditure of $155,000 and called for additional service on the part of the


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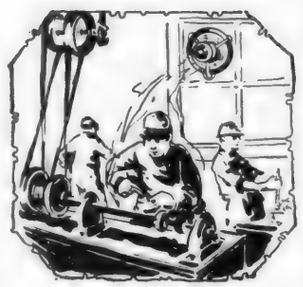

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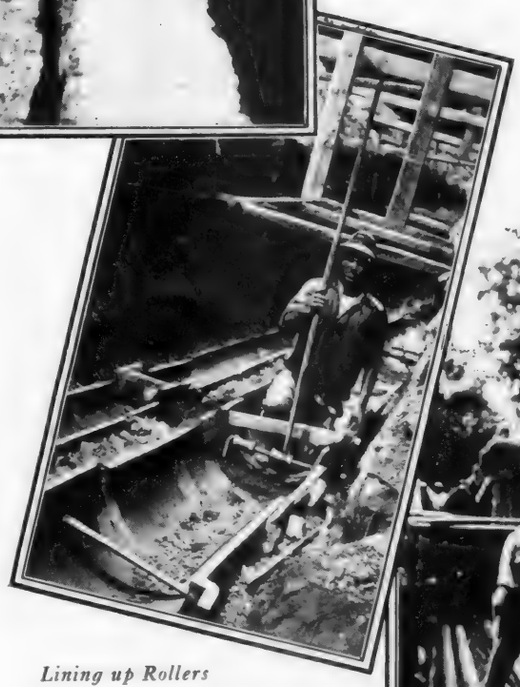

*Lining up Rollers*

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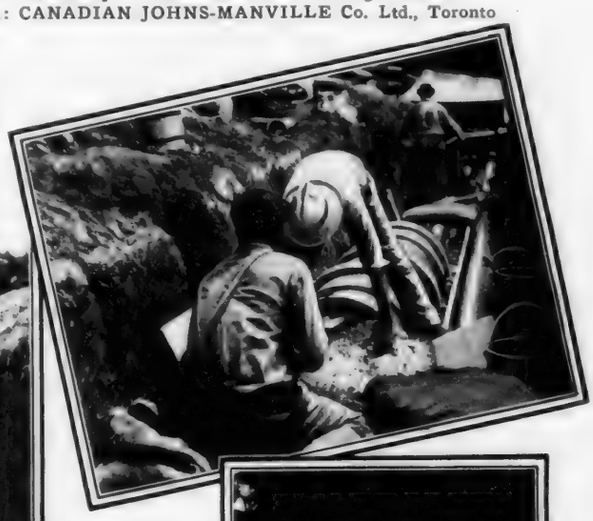
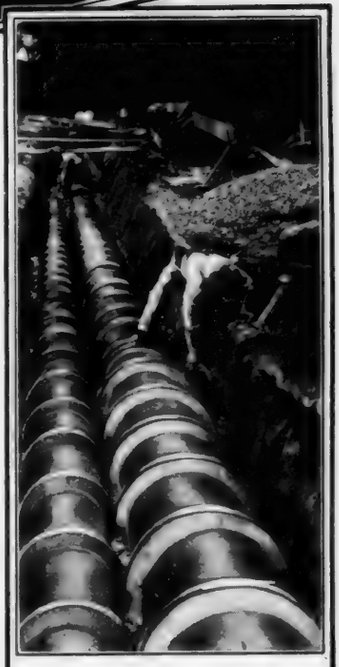


*Inserting the Insulating Material Inside Conduit*



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**An important decision** has been rendered by the United States Circuit Court of Appeals reversing the conviction of the twenty-three pottery manufacturers and nineteen individuals for violating the Sherman anti-trust law. The opinion was unanimous. A year ago at the trial Federal Judge Van Fleet adjudged the defendants guilty and imposed fines amounting to $164,000, and jail sentences on nine of the defendants, running from six to ten months. The reversal is a victory for the contention of the potters who argued that the government had failed to prove any conspiracy which had resulted in an increase in price for sanitary earthenware.

## Manufacturers Notes

**Bristol Co.**, Waterbury, Conn., manufacturer of indicating and recording instruments, has established a mid-west service station in the Larkin building, 3617 South Ashland Ave., Chicago, Ill. The company will continue its present salesroom in the Monadnock building.

**Robert Gordon, Inc.**, announces its new and permanent address is 22–24 W. Austin Avenue, Chicago, Ill.

**Kuhlman Electric Company**, Bay City, Mich., has opened a sales office at 300 Madison Avenue, New York, in charge of D. F. Potter, Jr. Mr. Potter, a graduate of Cornell University, has been sales engineer for the company at Buffalo, N. Y.

**National Radiator Co.**, Johnstown, Pa., announces the appointment of Walter Schildman, sales engineer, Cincinnati, O., as district manager, with offices in the Union Central Building, Cincinnati. The company expects to establish a warehouse in Cincinnati at an early date.

**Buffalo Forge Co.**, Buffalo, N. Y. announces the opening, on June 1, of a new western office at Seattle, Wash. Arthur T. Forsythe of the Buffalo plant has been appointed western representative in charge. Territory embraced in the new office includes Oregon, Idaho, Montana, Alaska and Washington.

**American Radiator Co.**, New York, has declared dividends of $1 a share on the common and $1.75 on the preferred stock. The former is payable June 30 and the latter was paid on May 15.

**Nye Tool & Machine Works**, Chicago, Ill., has purchased 69,000 sq. ft. of land adjacent to the Lyon & Healy plant on Fullerton Avenue, in Chicago, at a cost of $40,000 and will erect a factory plant to cost $120,000. The new property is well served by railroads.

**A. M. Byers Co.**, Pittsburgh, Pa., has moved its New York office from 295 Broadway to Room 917, 110 East 42nd Street. M. J. Czarniecki is district sales manager.

**C. J. Brown Plumbing & Heating Co.**, Kansas City, Mo., is building a new home to cost $12,000 on recently purchased property at 16th and Harrison Streets.

**Crane Co.**, Chicago, Ill., has purchased control of the Trenton Potteries Co., Trenton, N. J. earthenware manufacturers, but the latter company is to be continued under the same management as a separate and independent unit. John A. Campbell will continue as its president.

**Johnson Service Co.**, Milwaukee, Wis., has moved its Chicago offices from 177 North Dearborn Street to 1355 West Washington Boulevard, where a showroom will also be maintained. J. A. Cutler is the company's Chicago manager.

**Trane Co.**, La Crosse, Wis., announces the removal of its Chicago offices to 844 Rush St., Chicago.

**Cochrane Corporation** is the new title of the H. S. B. W.-Cochrane Corporation, Philadelphia, Pa., formerly the Harrison Safety Boiler Works. The original company was founded in 1863 and is the manufacturer of the well-known Cochrane line of feed-water heaters, deaerating heaters,

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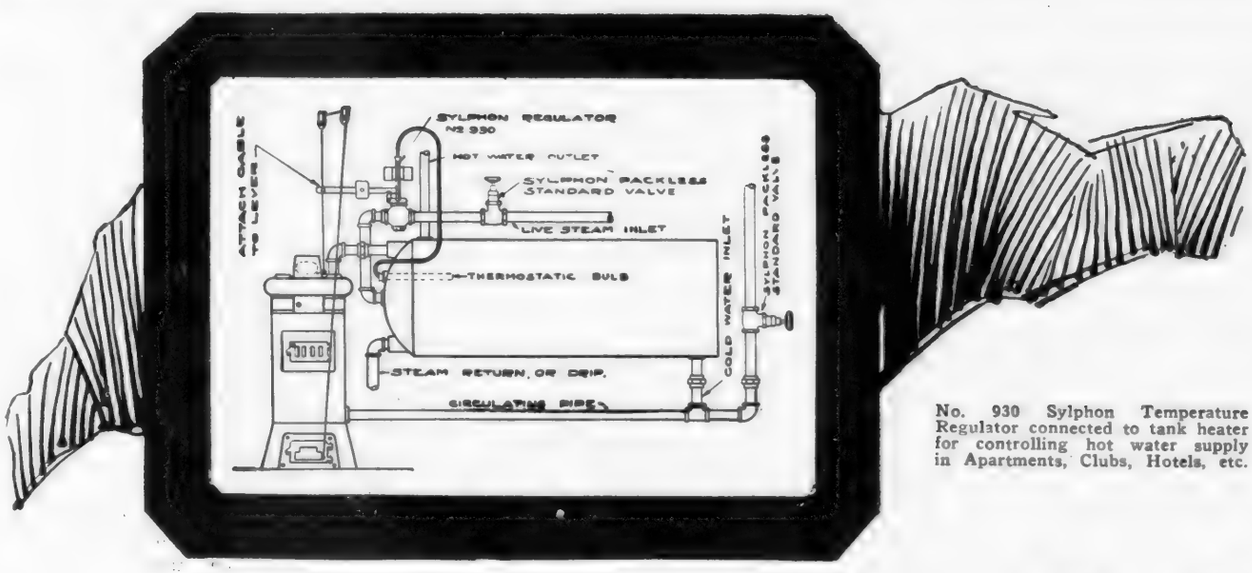
WHERE large volumes of air are to be handled at comparatively low pressures such as in heating and ventilating systems LEHIGH Multiblade Fans are guaranteed to be equal to, if not superior to, any other fans on the market.

HERSH BROTHERS CO.

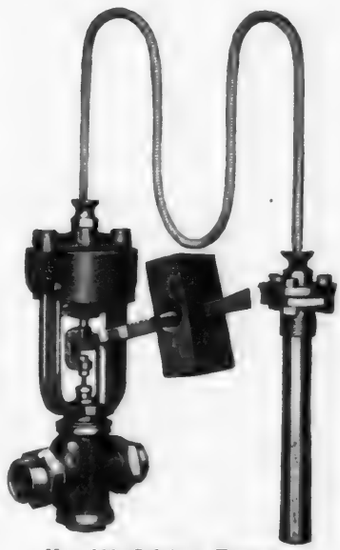
654 Mill Street ALLENTOWN, PA.




No. 930 Sylphon Temperature Regulator connected to tank heater for controlling hot water supply in Apartments, Clubs, Hotels, etc.

# In summer when the heating plant is shut down you can still have hot water

During the summer months you can install many Sylphon Regulators in Hotels, Apartments, etc., because when the main heating plant is shut down, there is still need of a constant supply of hot water. This detail drawing gives the answer to such situations. It shows how a great saving in coal and labor may be effected by utilizing a small coal-fired heater with a No. 930 Sylphon Temperature Regulator, regulating the temperature of the water in the supply tank by attaching the cable to the lever and thus controlling the action of dampers—no steam being necessary.



No. 930 Sylphon Temperature Regulator (lever type) for control of liquids; also No. 931 (spring type)

### Meet every demand for a controlled hot-water supply in this easy way

When you install Sylphon Temperature Regulators, you insure your client a lifetime of dependable temperature control service; hot water controlled to the temperature required, and no risk of scalded hands or spitting of steam from open faucets. The simplest, sturdiest regulators on the market, they maintain their unfailing accuracy due to the fact that they use as their expansion member the famous one-piece, seamless Sylphon Bellows—the most sensitive and flexible expansion member known.

And not only are they accurate, but compact and easy to install, requiring no auxiliary power to operate them.

### Let our Engineers help you with Temperature Control problems

We invite Heating Engineers to an open use of the 20 years of gainful experience obtainable in the Fulton laboratories. As a first step, get Bulletin WTR 103.

*Temperature Regulators*

## THE FULTON COMPANY KNOXVILLE, TENN.

New York Chicago Detroit Boston Philadelphia

*Representatives in All Principal Cities in U. S.*

*European representatives:*
Crosby Valve & Engineering Co., Ltd., 41-42 Foley Street, London, W. I., England

*Canadian representatives:*
Darling Bros., Ltd., 120 Prince Street, Montreal, Canada

metering heaters, flow meters, water softeners, filters, back-pressure valves, etc. The change has been made to obtain a shorter, simpler and more usable name and implies no change in the company's organization or products.

**American Radiator Co.**, New York has moved into its new building at 40 West 40th Street. The company occupies fourteen floors in the new building, including the top ten stories. Its old home on West 42nd Street is being torn down.

**M. Stulsaft Co.**, San Francisco, Calif., has added steam heating supply departments at the following branches: San Francisco, Oakland, Calif., and Los Angeles.

**Kellogg-Mackay Co.**, Chicago, manufacturer of boilers, radiators and heating and plumbing supplies, will move its factory and offices from 419 West 18th Street to the "Central Manufacturing District," where the trustees of the district have sold the company 70,000 sq. ft. of land on the south side of West 37th Place, at Loomis Place and the Chicago River. Three buildings, it is announced, will be built at once. The largest, a factory and warehouse, will cost $310,000. It will be of brick and concrete construction, four stories and basement, with about 97,000 sq. ft. of floor area and platform space. The first floor will be placed at car level. The second building will be of brick and steel construction, with the floor at ground level. This building, to be used as a pipe shed, will provide 8400 sq. ft. of floor area. It will adjoin the main building. The third building will go up to the east of the pipe shed. It will be a one-story structure of brick. Its 5000 sq. ft. of floor area wil be used as a pipe shop.

**Central Foundry Co.**, New York, announces the appointment of B. A. Schutz as vice-president and general manager of sales. Mr. Schutz was until recently manager of the company's western sales office in Chicago. He will make his headquarters in New York. He has been succeeded in the Chicago office by J. J. Murphy, who has long been connected with the company.

**W. G. Cornell & Co.**, New York, heating and plumbing engineers and contractors, announce the removal of their executive offices to Long Island City, where quarters have been taken in the American Chicle Building, Thompson Avenue and Manley Street. Extensive warehouse facilities have been provided at the new address which will greatly facilitate the company's operations.

**Walworth Mfg. Co.**, Boston, Mass., through President Howard Coonley, announces the taking over by the company of the firm of H. Munzing, Ltd., London, Eng. The firm had acted as agents for the Walworth company in the British Isles for 32 years. The step was taken, it was announced, to preserve to the company the largest distributor of American steam products.

**L. O. Koven & Bro., Inc.**, Jersey City, N. J., has been formed to take over the co-partnership business of L. O. Koven & Bro. The officers are: President, G. H. Koven; vice-president and treasurer, L. O. Koven; secretary, William Schulmerich.

**Caloroil Burner Corporation**, New York, 61 Broadway, New York, has equipped an experimental laboratory in Jersey City where a study is being made of oil-burning problems. The officers of the company are: President, George Bullock, formerly president of the United Gas & Electrical Corporation; and vice-president, Charles R. Bishop, formerly secretary of the American District Steam Company.

**Bishop & Babcock Co.**, Cleveland, O., announces that all of its heating specialty and temperature control business will be handled hereafter at its factory branch headquarters in New York at 444 Lafayette Street. The company's Chicago office, as well as that of its subsidiary, the Massachusetts Blower Company, are now at 112 West Austin Street, Chicago.

## Central Station Heating Notes

Ames, Ia.—The legislature has appropriated an additional $10,000 to complete installation of the new State

Burt Metal Top Sliding Sleeve Damper Ventilator

**Specify BURT Ventilators**

The greatest aid to Efficiency and Health is good Ventilation.

Constant effort on the part of our designers and engineers has placed the Burt line of ventilators at the highest point of ventilating efficiency.

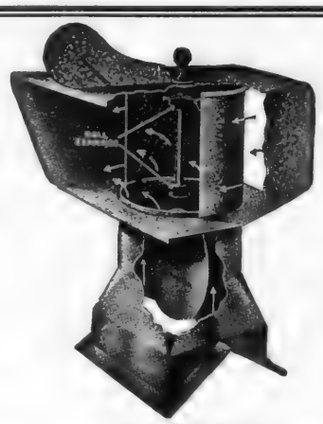
There is a Burt type for every condition.

Let our engineering department show you why you should specify Burt Ventilators.

**The Burt Manufacturing Co.**

**261 Main St., Akron, Ohio**

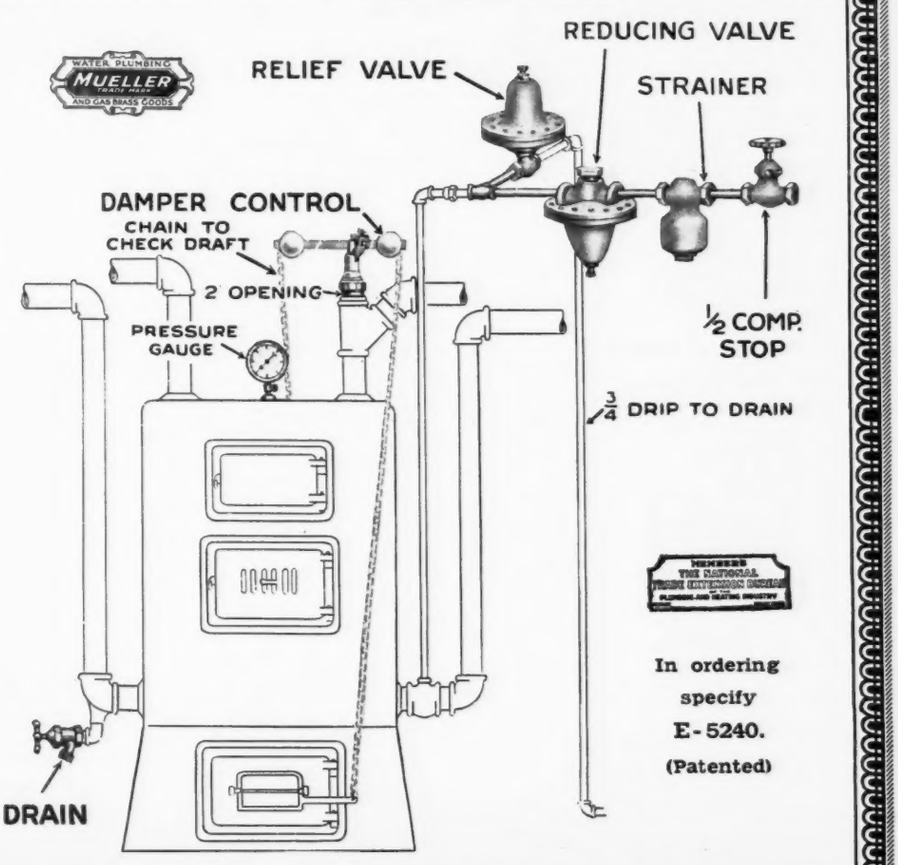
*Geo. W. Reed & Co., Montreal, Sole Manufacturer of Burt Ventilators for Canada.*



Burt Ball Bearing Revolving Ventilator

SEE OUR DETAILED DATA IN ASH&VE GUIDE

SEE OUR DETAILED DATA IN ASH&VE GUIDE




## *Here is a good field—with good profits*

Every hot water heating plant needs automatic control to make it absolutely satisfactory—to secure steady even heat—and to avoid the annoyance of constantly "fussing with the furnace."

# MUELLER

### *Automatic System of Hot Water Heat Control*

operates by city water pressure—does away with the unsightly expansion tank—automatically regulates the damper—controls both water supply and water pressure—insures rapid circulation at maximum heat.

Write for detailed information and prices.

**Mueller Co., Decatur, Ill., U. S. A.**

145-149 W. 30th St., New York; 1072-76 Howard St., San Francisco; 2468 Hunter St., Los Angeles

House heating plant. A previous legislature had provided $30,000 for the work.

**Waukegan, Ill.**—Business men of Waukegan are considering organization of a company to establish a central heating station to provide heat for business concerns previously served by the Public Service Co., which has been given permission by the State to abandon its plant here.

**Portland, Ore.**—Plans for extending the service of the heating system of the Northwestern Electric Co., to the west side residence district are being discussed. Service is now being rendered to 104 city blocks, in 23 blocks of which no other heating service is used.

**Lansing, Mich.**—The city board of electric light and water commissioners has adopted a recommendation to extend the city's steam heat distribution on East Michigan avenue, from the Cedar Street power plant to Larch Street. The cost of the proposed improvement is estimated at $35,000.

**Auburn, N. Y.**—Announcement of the Empire Gas & Electric Company, of Auburn, of its intention to discontinue its central station heating service, to the business district, due to the cost of rebuilding its present system, has led the owners of a number of buildings, including the Masonic Temple, the Odd Fellows' Temple, and other organizations and business firms to install separate heating plants in their buildings.

## New Incorporations

**Oil Heating Sales Co.,** Milwaukee, Wis., capital $50,000, to manufacture gas and oil heaters. Incorporators, E. Benson and others.

**General Oil Heating Co.,** Boston, Mass., capital $100,000. Incorporators: F. H. Andres and J. O. Conlin, Arlington; and W. J. Berkeley, Winthrop, Mass.

**K-B-C Heating Co.,** Minneapolis, Minn., capital $50,000, to manufacture gas and oil heaters. Incorporators: W. J. Blanchette and others.

**Oil Burner Sales Co.,** Boston, Mass., capital $50,000. Incorporators: Harry G. Starr, West Quincy; Jesse Y. Baker, Mel-

27—8554—Heating & Ventilating

rose Highlands; and Thomas W. Roulston, Mattapan, Mass.

**Lone Star Heating and Ventilating Co.,** Dallas, Texas, capital, $1,500. Incorporators: A. S. Foy, Henry Jackson and A. S. Foy, Jr.

**Main Burner & Heating Co.,** Kansas City, Mo., capital $50,000, to manufacture, sell and equip oil and gas burners. Incorporators: G. E. Main, D. W. Main and J. J. Stines.

## Contracts Awarded

**Bruner & Salz,** Waterloo, Ia., heating and plumbing new Y. W. C. A. building, Waterloo, Ia., for $29,286.

**Power Efficiency Co.,** Buffalo, N. Y., heating and ventilating new Lew's J. Bennett High School, in Buffalo. The building will cost $2,700,000. Buffalo Forge fans are being used.

## Business Removals

**Webster Tallmadge,** engineering specialist, New York City, removed May 1 from 50 Church Street to the new Westinghouse Building, 150 Broadway.

**Geo. A. Henrich Co.,** Chicago, Ill., heating engineers, announces the removal of its offices to 702 North Wells Street, Chicago.

## Chamber of Commerce of United States

An interesting feature of the annual meeting of the Chamber of Commerce of the United States, in Cleveland, May 6 to 8, was the report of the Committee on Business Ethics, outlining fifteen fundamental principles for the conduct of business.

These principles are:

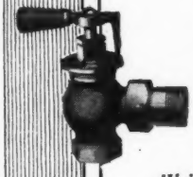
1. The foundation of business is confidence, which springs from integrity, fair dealing, efficient service and mutual benefit.
2. The reward of business for service rendered is a fair profit plus a safe reserve, commensurate with risks involved and foresight exercised.
3. Equitable consideration of capital, management, employees and the public.
4. Thorough and specific knowledge.
5. Permanency and continuity of service.

**FOSTER "VACUUM" PUMP GOVERNOR**

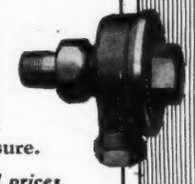
Suitable for steam-driven vacuum pumps. Will maintain a uniform and positive vacuum within 26" maximum (if desired.) Globe (straightway) screwed body only. Sizes 1½" and smaller, all composition; 2" composition or iron body, composition trimmed. Orders should specify available steam pressure and the desired vacuum (in inches.)

**FOSTER ENGINEERING CO., NEWARK, N. J.**

VAPOR-VACUUM STAY-RITE SPECIALTIES



Stay-Rite All-Metal Radiator Traps and Valves are a good proposition for Jobbers, Contractor and user alike, because they are simple, profitable and sure.



*Write to day for literature and prices.*

THE IDEAL HEATING EQUIPMENT CO.
1250 WEST 4TH ST.
CLEVELAND, OHIO

KIELEY
REGISTERED TRADE MARK

**Steam, Water and Air Specialties**

'98 REDUCING VALVE
125 Lbs. to 1 oz.

Manufacturers of the Complete Line

Send for Catalog 1923

**KIELEY & MUELLER, Inc.**

Main Office and Works
34-38 West Thirteenth Street
New York, N. Y.

RETURN TRAP
High or Low Pressure

# *Buy it by the year —not by the foot*

*At Kansas City*

You will be within easy reach of the following installations of RIC-WIL:

Western University, Kansas City, Kansas
Washburn College, Topeka, Kansas
Odd Fellow's Home, Liberty, Mo.
State Normal School, Maryville, Mo.
State Hospital No. 3, St. Joseph, Mo.
Security Benefit Hospital. Topeka, Kansas
Kemper Military Academy, Bonneville, Mo.

*Consider how a conduit system that locks together, part by part, perfectly, quickly, rigidly, as* RIC-WIL *does, must serve your client with sound economy and year-after-year profit. And yet the first cost of* RIC-WIL *installed is no greater than any other.*

YOU can specify underground conduit that sells at almost any price per foot you want to pay. But the actual cost to your client depends on the number of years the conduit serves him. The longer it lasts the less it costs.

Recently a so called "cheap" installation only six years old went completely bad because its drainage system failed. It has to be replaced. There is no economy in that.

Thousands of installations of RIC-WIL are evidence of its permanence. RIC-WIL has a lower yearly cost than any other conduit.

*The reasons for* RIC-WIL *economy are made clear in our new Catalog. Send for your copy.*

THE RIC-WIL COMPANY, 1570 UNION TRUST BUILDING
CLEVELAND, OHIO

RIC "9t Interlox" WIL

UNDERGROUND CONDUIT~~

6. Improving conditions of employees.
7. Carrying out of contracts, written or oral.
8. Truthful representation of goods.
9. Avoid waste in any form.
10. Avoid excesses—inflation, over-expansion, etc.
11. Fair competition.
12. Settle controversies by voluntary agreement or impartial arbitration.
13. Corporate forms do not alter moral obligations of individuals.
14. Lawful co-operation among business men through useful business organizations.
15. Business should render restrictive legislation unnecessary through so conducting itself as to deserve and inspire public confidence.

### New Data on Building Costs

Building costs in the United States, in the midst of what economists have agreed is the country's greatest construction boom, have doubled in the last ten years, according to an announcement issued April 12 by the National Industrial Conference Board, 10 East 39th Street, New York. In its announcement the board summarized the results of a study it has been making of the national building situation. A noteworthy finding of the study is that costs of labor and materials stand at exactly the same increased levels, for the first time since 1920.

### Public Health Summer Schools

At the suggestion of the United States Public Health Service, public health summer schools will be conducted this year by Columbia University, the University of California, the University of Iowa and the University of Michigan. At Columbia University, New York, the course extends from July 7 to August 15; at University of California, Berkeley, from June 23 to August 2; at University of Iowa, Iowa City, from June 9 to July 18; at University of Michigan, Ann Arbor, from June 23 to August 2. Requests for announcements should be addressed to the deans of the summer sessions.

Under public health engineering, ventilation will be considered from the viewpoint of the underlying physiological and chemical data and the fundamental principles, while the practice will be dealt with in outline.

## WANTED

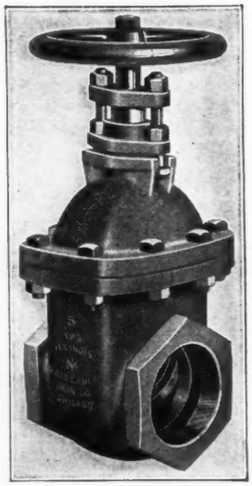
Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

SUPERINTENDENT WANTED—To take entire charge of erecting department for contractor specializing in ventilating systems, with an annual volume of about two million pounds. The man wanted must be a specialist in this art, a driver, yet tactful to get the most out of the field forces. He must be competent to accurately estimate installation costs and keep our factory supplied with orders well in advance to avoid peak loads and high production costs. We have a permanent position for the right man. An application will be treated confidentially. Give full particulars in your application. Address Box 64, care Heating and Ventilating Magazine.

POSITION WANTED—By engineer with 18 years' experience in heating, ventilating and power work. Has practical, technical and executive experience. Would like to make connection with a good, reliable contractor who is in a position to handle large contracts. Address Box 61, care of Heating and Ventilating Magazine.

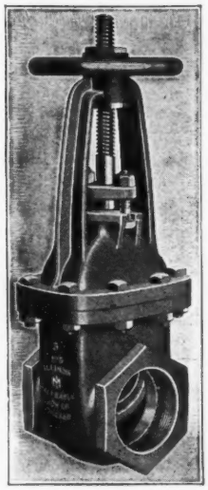
SITUATION WANTED—Heating and ventilating engineer, Canadian, 29 years old, desires position on the sales force of American company handling a line of heating and ventilating equipment, with the prospect of eventually representing the firm in Canada. Has a modern and progressive training in business, sales letters, and personal selling; a positive personality and five years' practical experience on the road to back it up. Very familiar with fan and blower equipment but also interested in heating specialties or associated lines. Address Box 62, care Heating and Ventilating Magazine.


# IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS



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Cast and Malleable Iron Fittings

**Illinois Malleable Iron Company**

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